Memorandum

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RE: Lower Fox River OU4 *COMMP* Cap Integrity Assessment - Year 2

Background

Lower Fox River Remediation LLC (LLC) retained Foth Infrastructure & Environment, LLC (Foth) to document the methodology employed for and the results of the Year 2 hydrographic survey in compliance with requirements of the *Lower Fox River Remedial Design Cap Operations, Maintenance, and Monitoring Plan* (*COMMP*) for the Lower Fox River Operable Units 2-5 (Anchor QEA and Tetra Tech EC, 2009), which was approved by the Agencies/Oversight Team (A/OT) on April 22, 2009. The *COMMP* describes post-placement cap monitoring activities that will be performed to provide a high level of assurance that the engineered caps retain their physical integrity and protectiveness over time. The *COMMP* also outlines contingency response actions that will be implemented if the engineered caps do not meet performance standards.

On June 29, 2011, the LLC met with representatives of the A/OT to discuss the *COMMP* and gain concurrence on the methods to be employed for monitoring of the engineered caps. Discussions during this meeting refined and clarified several items such as monitoring requirements and schedule. Meeting minutes for this meeting were drafted by Tetra Tech EC (TtEC) and accepted by the A/OT, on August 4, 2011, and were included as Attachment 1 in Foth's June 22, 2015 memorandum regarding "LFR OU4 COMMP Hydrographic Survey-Year Zero" (Foth, 2015) (herein referred to as the "Year 0 memo").

As part of the *COMMP* requirements for OU3-5, routine monitoring of all caps by geophysical methods (including sub-bottom profiling and/or hydrographic survey) will be completed at the agreed to frequency. Further, the *COMMP* states the first routine monitoring of completed engineered caps shall be completed 2 years post-construction (denoted as the "Year 2 survey"). This routine monitoring includes the completion of a hydrographic survey to analyze the top of engineered cap elevations and the change in that surface, if any, over time. In order to evaluate the change in top of cap elevation over time, a baseline or reference point needed to be established. Baseline cap elevations were established by completing a hydrographic survey of caps placed in OU4 in 2013-2014 following completion of construction, totaling approximately 52.3 acres. The hydrographic survey documenting the baseline conditions has been termed the "Year 0" survey. The locations of the 52.3 acres of capped areas in OU4 placed in 2013-2014 are illustrated on Figure 1.

To supplement the hydrographic surveys for determining if erosion of the armor layer over more than 5% of a cap certification unit (CCU) has occurred (a requirement of the *COMMP*), the cap areas are assessed using a poling/probing survey each time a routine (or river flow event-triggered) hydrographic survey is completed. The main objectives of the poling/probing survey is to determine if the armor stone layer is intact (i.e., present) and how much, if any, cap settlement and/or sediment deposition has occurred since placement of the caps. If the top of cap elevation has lowered since its original installation, but physical poling/probing confirms the armor stone remains present, it will be concluded that the sediment underlying the cap has consolidated causing the surface of the cap to subside rather than that the cap has eroded.

This memorandum presents the methods utilized and the results of comparing the Year 2 to the Year 0 hydrographic surveys, as well as of the Year 2 poling/probing survey for the 52.3 acres of caps placed in OU4 through 2014. In addition, integrating sediment deposition measurements into hydrographic survey elevation data, this memorandum compares the Year 0 and Year 2 top of cap elevations and assesses if more than 5% of any CCU has experienced erosion or other damage that will not allow it to function as designed.

Finally, this memorandum provides the results of an evaluation of the 20-year and 100-year recurrence-interval flow rates for OU4. The *COMMP* requires: "In addition to the scheduled monitoring of all capped areas in OU3-5, supplemental bathymetric surveys will be performed only in "sentinel" capping areas following major river-flow events…that may have a significant impact on river hydrodynamics…Sentinel cap area monitoring will be performed within 1 year following a river flow (combined flood and seiche discharge) event with a recurrence interval of 20 years or more…Hourly average flows exceeding the 20-year return-interval flow rate (i.e., 21,000 cfs for OU3 and 22,100 cfs for OU4) will be used to trigger the supplemental bathymetric surveys." Furthermore, the *COMMP* requires: "If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a

100-year flow event (e.g., 25,500 cfs for OU4)." Sentinel capping areas are described further in the *COMMP*.

In addition to the high flow-event based monitoring, the *COMMP* requires: "Supplemental bathymetric surveys will also be performed within 1 year following major river construction events (e.g., new bridge construction) and/or within 1 year following the occurrence of low-water elevations (defined as the lowest monthly average within a given water year, April to March) that are more than 1 foot below the low-water elevations used to develop the cap designs (see Section 3.2 of the *COMMP*)…If cap integrity and performance are verified following water level conditions that are more than 1 foot below the design low-water elevation, follow-on event-based cap monitoring will occur following water level conditions that are more than 2 feet below the design low-water elevation (see Section 3.2 of the *COMMP*)... Lake Michigan water levels are currently measured at the National Oceanic and Atmospheric Administration (NOAA) gaging station near the mouth of Green Bay (Station No. 9087079). Annual low-water elevations (defined as the lowest monthly average within a given water year) from the NOAA gaging station will be assessed each April after typical annual low water periods between November and March. If the gage records indicate that the monthly average for any month during the previous water year (April to March) was more than 1 foot below the remedial design (RD) baseline water elevation (576.6 feet NAVD88 outside of the navigation channel and 577.6 feet NAVD88 in the navigation channel in OU 4), supplemental bathymetric surveying will be triggered for the following fall after the spring flood season and summer recreational boating season."

The LLC has verified that, since April 2014, water levels in OU4 have not met these low level thresholds and therefore are not further discussed in this memorandum (refer to the table and graph provided in Attachment A).

Year 0 (2014) Hydrographic Survey

On November 13 and 14, 2014, J.F. Brennan Company (Brennan) completed hydrographic surveys of approximately 52.3 acres of engineered caps in OU4 in accordance with the *COMMP*. Foth audited Brennan's surveys. Auditing reports for the completion of these surveys are included as Attachment 2 of Foth's Year 0 memo (Foth, 2015).

The hydrographic survey data collected for the Year 0 cap monitoring indicated that the cap aggregates in place met the performance standards set forth in the *Lower Fox River Remedial Design 100% Design Report* (Tetra Tech et al., 2009) and the *COMMP,* and with one exception, no irregularities were identified. The exception was the isometric view for CA27AB (Figure 13B of the Year 0 memo). Linear irregularities were evident in the isometric view on the north east end of the cap. Foth investigated the potential causes for these linear irregularities and found that multiple pipelines used for dredging and/or spreading operations were traversing this cap area at the time of the survey data collection. The Year 0 surveys were accepted by A/OT to serve as the baseline for future surveys to assess long-term cap performance, as indicated and discussed in further detail in the Year 0 memo.

To supplement the Year 0 survey information, cap thickness verification data, prepared by TtEC (Attachment 3 of the Year 0 memo), was reviewed. These data indicate that when applying A/OT-approved statistical procedures (i.e., summary statistics), the minimum cap aggregate thicknesses were achieved in all cases when the caps were placed.

Year 2 (2016) Hydrographic Survey

The subsequent routine post-cap monitoring event, required by the *COMMP* (Year 2), was completed on October 18, 19, and 25, 2016 and December 1, 2016 over the 52.3 acres of engineered caps placed in OU4 during 2013 and 2014, following nearly identical protocols summarized for Year 0 above (variations from the Year 0 methods are noted) and as described in more detail in the remainder of this memorandum, as well as in the *COMMP*.

The vast majority of the caps are in areas with water depths of greater than 3 feet; therefore, a multi-beam survey system was utilized to provide a high degree of accuracy and coverage, with the exception of Cap Areas CBD23-27, CAD118, and CB33. Cap Areas CBD23-27, CAD118, and CB33 were surveyed on October 25, 2016 using single-beam survey technology due to the water being too shallow for multi-beam survey equipment. The multi-beam survey work was conducted using a 400 kilohertz (KHz) acoustical system and the single-beam work a 200 KHz system. All survey work was performed by Brennan and audited by Foth. The hydrographic survey audit forms are provided in Attachment B. The survey work, including survey control check-in and check-out procedures and hydrographic survey QC procedures, were carried out in compliance with the OU2-5 *Quality Assurance Project Plan* (TtEC, et al., 2016) and industry standards. The Foth auditor reviewed the results of the performance and patch tests for compliance with hydrographic survey specifications and industry standards. Foth obtained raw survey files and gridded survey files (2 feet x 2 feet) from Brennan in a format consistent with the 2014 Year 0 survey of the same area. The Year 2 survey information was processed and plotted by Foth for visual review to identify failing or damaged cap areas.

Results from the Year 2 hydrographic survey have been compared to the baseline (Year 0) to assess integrity of the caps, which is discussed below in the Cap Integrity Assessment section.

Poling/Probing Evaluation

To better compare elevation changes in the capped surface over time, Foth collected poling/probing measurements to determine if and to what extent sediment deposition occurred between Year 0 and Year 2. When sediment deposition thickness was measured, the presence of the armor layer was also verified by poling through sediment, if present, and “feeling” the armor layer with the poling rod (probing).

Statistical Determination of Poling/probing Locations

The appropriate number of poling/probing locations to be occupied is determined using statistical confidence limits with a lower 95% confidence limit targeted as described in the following paragraph. This methodology was previously presented in the November 1, 2016 memorandum *Lower Fox River OU2-5 - OU4 COMMP Armored Cap Poling/ Probing for Evaluation of Caps Placed 2013-2014* (Foth, 2016) and accepted by the A/OT via email correspondence on November 2, 2016.

As a means of providing statistical confidence in the cap integrity evaluation, a minimum of 60 poling/probing locations were selected. Assuming that the armor layer is observed at all 60 locations, this number of monitoring points provides 95% statistical confidence that a minimum 95% proportion of the cap has maintained integrity (as measured by the armoring layer of the cap being present). Specifically, when all 60 locations (100% proportion) indicate armor integrity, a lower statistical confidence limit (exact binomial) can be calculated on this proportion (Conover, 1999) as follows:

> The lower 95% confidence limit on the observed 100% proportion is found by selecting the largest proportion (p_1) such that:
>
> $$P(Y \geq y|p = p_1) = \alpha = \sum_{i=60}^{60} \binom{60}{60} {p_1}^{60}(1 - p_1)^{60-60} = {p_1}^{60} \leq 0.05.$$
>
> Solving the above (for p_1) results in a lower confidence limit of 0.951 ≈ 0.95. This implies there is 95% confidence that a minimum 95% proportion of the cap area has maintained integrity.

In addition to the poling/probing's providing confidence that the armored cap is present, the sediment thickness measurements at each of the 60 locations can be used to determine the thickness of sediment across the capped areas and be factored into isopach drawings depicting the change in cap elevation over time.

Using the base number of 60 poling/probing locations, a 170-foot grid was used to locate the 60 poling/probing locations within the cap areas. Based on previous A/OT review comments and experience in OU3 (*Lower Fox River OU3 COMMP Cap Integrity Assessment - Year 3* [Foth, 2015]), poling/probing locations were added to the OU4 Year 2 locations, more specifically in the smaller cap areas, to provide more complete coverage within the cap areas. Some of the poling/probing locations also needed slight adjustment from the exact 170-foot grid coordinates so that they fell within a 10-foot buffer inside the CCU areas. Location additions and slight adjustments were also made to provide coverage of areas with discernible increases (i.e., deposition) or decreases in elevation (i.e., depressions, gullies, etc.). Ninety-nine (99) poling locations were added for the purposes described above; therefore, the total number of proposed poling/probing locations was 159. Poling/probing locations are provided on Figures 2C through 14C (i.e., Figures 3C, 4C, 5C, etc.).

Poling/Probing Survey – Deposition Measurements

On November 3 and 4, 2016, Foth performed deposition measurements within the 52.3-acre capped areas utilizing a Foth vessel equipped with real-time kinematic global positioning system (RTK GPS). At each of the 159 poling/probing locations, while hovering with the sampling vessel, top of sediment elevation was determined with a graduated pole fitted with a 6-inch diameter disc. At the same locations, a probing rod with 1-inch diameter probing tip was advanced until armor stone was encountered, and the elevation of the top of armor stone was determined. Thickness of sediment deposition above the caps was then determined at each location. Field observations were recorded in field activity observation reports, which are included in Attachment B. Table 1, in Attachment B, presents the poling/probing data. Note that the sediment thicknesses shown in the table are the exact measurements recorded in the field; however, the rocky surface should be considered in that the water elevation is measured using a 6-inch diameter disc, which sits on top of the surface, whereas the sediment thickness is measured using 1-inch diameter poling rod, which can fit within cracks and spaces in the rocky surface (particularly apparent in areas of quarry spall placement). Table 1 identifies locations in which the presence of soft sediment deposition was obvious (e.g., P8 and P11), indicated by "sog" or "sor" (i.e., soft over gravel or soft over rock, respectively).

The poling/probing survey indicated that armor stone or quarry spall was present at each of the 159 locations visited. Note that P108 was inadvertently placed within the 10-foot buffer and poling/probing indicated soft material; therefore, poling/probing was performed at two additional locations, offset from the original location outside of the 10-foot buffer within the cap limits, to confirm the presence of armor stone. With the 159 selected locations, all having armor stone present, there is greater than 95% statistical confidence that a minimum 95% proportion of the cap has maintained integrity. In fact, the confidence level approaches 99%. Furthermore, poling/probing measurements indicate that several of the evaluated cap areas have accumulated sediment (depositional areas) over the two year time period evaluated, particularly in the Cap Area of CB39 and surrounding area in CB39-1-1. Deposition in this area is expected due to the decrease in river flow caused by widening of the river channel below the De Pere Dam, creating slack water. Other areas containing deposited sediment, but to a lesser extent, include the following:

- CB6-1-1: along the shoreline, at the toe of slope along the border of CB6-1-1 and D24-RDMU1, and in a depression along the northern edge of CB6-1-1 (as shown on Figures 3B, 3C, and 3D).

- CAD118: at the toe of slope near the west edge (as shown on Figures 6B, 6C, and 6D).

- CB45-1/CA24B-1/CB45-2: at the toe of slope where the border of the three areas meet (as shown on Figures 10B, 10C, and 10D).

Accumulation of sediment is anticipated in these types of environments. The poling/ probing information was integrated into the cap integrity assessment, as discussed below.

Cap Integrity Assessment by CCU (Comparison of Year 0 and Year 2 Surveys)

Upon completion of the Year 0 and Year 2 hydrographic surveys, the data were processed and top of cap contours were created. A set of figures were prepared for visual review to identify failing or damaged cap areas. Figure 1 illustrates the 2013-2014 cap placement areas totaling approximately 52.3 acres in OU4. Figures 2 through 14 illustrate the top of cap elevations for the 2016 Year 2 survey and the elevation differences between the 2014 and 2016 surveys. Each figure set includes an "A" figure, which depicts the top of cap elevations; a "B" figure, which depicts the top of cap elevations in a three-dimensional isometric view (as an added visual aid to assess cap integrity); and a "C" figure, which depicts the 2014 and 2016 differences in elevation (isopachs). For some cap areas, "D" series figures were added to offer cross sections to better depict anomalous conditions.

In viewing the approximate 52.3 acres of capped areas placed in OU4 in 2013-2014, there are several areas of interest as described below:

- General elevation decreases 0.0-0.5' between the 2014 and 2016 surveys are noted throughout the OU4 cap areas. This decrease in elevation of the top of the caps is likely the result of consolidation of the underlying soft sediment, which is expected given the short duration since completion of capping activities.

- Two triangular-shaped depression areas are visible in the mudline elevations in CBD23-1 (Figure 2B). No abrupt change in elevation is found, however, when comparing to the isopach difference figure (Figure 2C). Therefore, the depressed areas on Figure 2B are likely a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.

- The isopach difference (Figure 2C) indicates that the 2016 survey is higher than the 2014 survey by 1.0-2.0' in a large portion of CB39 and the surrounding areas in CB39-1-1. Poling/probing measurements confirm that deposition of sediment has occurred in these areas of a similar magnitude as that indicated in the survey, as shown on Figure 2C. The poling/probing evaluation determined soft sediment exists over the cap armor stone.

- A depression area is visible in the mudline elevations along the northern edge of CB6-1-1 (Figure 3B). No abrupt change in elevation is found, however, with this area when viewing the same areas in the isopach difference figure (Figure 3C). Therefore, the depressed area on Figure 3B is likely a reflection of the river bottom topography. To further confirm the integrity of the cap in this area, a cross-section was cut through the depressed area (Figure 3D). The 2014 and 2016 surveys follow a similar contour confirming that the depressed area on Figure 3B

is a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.

- The 2016 top of cap elevations in D24-RDMU1 (Figure 3B) appear highly irregular. No abrupt change in elevation is found, however, when comparing to the isopach difference figure (Figure 3C). To further confirm the integrity of the cap, a cross-section was cut through the area (Figure 3D). The 2014 and 2016 surveys follow a similar contour confirming that the irregularity seen on Figure 3B is a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.

- Caps containing small depressed areas in which the 2016 top of cap elevation was 0.5-1.0' lower than the 2014 top of cap elevation were prevalent, and due to the isolated occurrences and locations of the depressed areas within the caps, integrity of these caps is not anticipated to be a concern. However, caps with a large portion of the area lower in elevation by 0.5-1.0', as in CC9, required additional evaluation.

  The soft sediment underlying Cap CC9 are expected to consolidate more in response to the additional loading of quarry spall and overall thickness of the C-cap. To confirm the integrity of the cap in this area, a cross-section was cut through CC9 (Figure 3D). The 2014 and 2016 surveys follow a similar contour indicating that the depression is likely due to consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor rock.

- The top of cap elevations along the southern edge of CBD23-27 (Figure 4B) dips toward the south; however, the isopach difference (Figure 4C) indicates that the 2016 elevations are higher than the 2014 elevations by 0.5-1.5'. Therefore, this area reflects a depositional location. The poling/probing evaluation determined soft sediment exists over the cap armor stone.

- The isometric view for the top of cap elevations for CAD118 and the portion of CB30 east of CAD118 (Figure 6B) appeared irregular; therefore, a cross-section was cut through these areas (Figure 6D) to confirm cap integrity. The isopach difference (Figure 6C) did not show similar irregularities and the 2014 and 2016 surveys follow similar and parallel contours indicating that the irregularity is likely a reflection of the river bottom topography and consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.

- The isometric view for the top of cap elevations for CB33 (Figure 9B) appeared irregular and several depressed areas 0.5-1.5' were apparent in the isopach difference (Figure 9C); therefore, a cross-section was cut through the area (Figure 9D) to confirm cap integrity. The 2014 and 2016 surveys follow similar and parallel contours indicating that the irregularity is likely a reflection of the

river bottom topography and consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.

- Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.

An accounting of evaluations and recommendations made during each post-cap monitoring event for each cap area is provided in Table 1.

The following section further addresses measured decreases in the elevation of the tops of caps and a statistical evaluation of cap elevation changes over time.

Statistical Evaluation of Survey Differences by CCU

In order to further quantify the observed differences between the 2014 and 2016 survey elevations, data sets of elevation differences, along a 5-foot by 5-foot grid, were generated and evaluated through statistical box plots for each CCU. These distributions are illustrated on Figures 15A, 15B and 15C. The data were generated by subtracting the 2014 elevation from the 2016 elevation at each 5-foot by 5-foot grid node. Positive values reflect elevations which are higher in 2016 than 2014, while negative values reflect elevations which are lower in 2016 than in 2014.

The boxplots on Figures 15A through 15C for each cap area are shown in order from upstream to downstream. In the boxplots, the grey box represents the 25th to 75th percentiles (quartiles), with the whiskers reaching to the minimum and maximum data points, or to the quartiles plus/minus 1.5 times the inner quartile range (IQR), whichever is first. Asterisks denote outliers past 1.5 times the IQR, and circles denote outliers past 3 times the IQR. The mean of the data is represented by a blue diamond and the median by a solid black line.

The majority of CCUs are seen on Figures 15A through 15C to have survey differences which are lower on average by 0 to 0.5 feet in 2016 than in 2014. This matches the general observations made above for the cap integrity assessment. The only area which has an average decrease of over 0.5 feet is for CC9 (Cap Type C with quarry spall) with an average decrease in cap elevation of 0.51 feet, likely due to the increased weight of the capping materials).

Of interest in the data sets are the 5th percentiles for each CCU, since this is the value that will be exceeded by 95% of the data. If 95% of the data fall above a desired threshold

value, further evidence is provided that cap integrity is maintained for 95% of the CCU area.

The 5th percentile for each CCU on Figures 15A through 15C is indicated by a solid gold line. For comparison, the solid blue line indicates the combined vertical error estimate of the 2016 and 2014 surveys based on equipment manufacturer information. The vertical accuracy for the 400 kHz multi-beam sonar is ± 0.2 to 0.3 feet, and the vertical accuracy of the 200 kHz single beam sonar is ± 0.1 to 0.2 feet. Assuming a 0.25 foot accuracy for the multi-beam survey, the propagation of errors formula $\sqrt{(Error^2_{Survey1} + Error^2_{Survey2})}$ would predict the differential accuracy to be approximately 0.35 feet.

The 5th percentile of the data (Figures 15A through 15C gold line) extends past the combined vertical survey accuracy (blue line) for CBD23-1, CB6-1-1, CC9, CB30, CAD118, CA80A-1, CA80B-1, CB43, CB33, CB45-1, CA23A-1, CB45-2, CB45-3, CA24B-2, CA24C, CA27AB, CB89A and CA89B. Therefore, potentially more than 5% of the area for these CCUs has experienced an elevation decrease from 2014 to 2016 which exceeds the combined survey vertical accuracy. As noted above, however, physical poling/probing confirmed in 2016 that armor stone remains intact at all locations visited, and therefore, it is assumed that the underlying soft sediment has consolidated resulting in settlement of the surface of the cap rather than the cap having been eroded.

As a note, several areas depicted increases in average elevation from 2014 to 2016. These are CB39, CB39-1-1, CBD23-27, CB11A-1 and CA24D. Of these, the largest elevation increase clearly occurred in CB39 and the surrounding area in CB39-1-1, with a median increase of 1.22 feet in CB39. The poling/probing survey confirmed that the increase in elevation in CB39 and CB39-1-1 is due to sediment deposition. As stated above, deposition in this area is expected due to the decrease in river flow caused by widening of the river channel downstream of the De Pere Dam. The average elevation increase for CBD23-27, CB11A-1 and CA24D was much less (0.15 feet or less) with the existence of sediment not confirmed with the discrete poling/probing locations.

20- and 100-Year Flow Rate Evaluation

Foth performed an evaluation of the 20-year recurrence-interval flow rate for the period between the Year 0 and Year 2 surveys. The *COMMP* requires: "In addition to the scheduled monitoring of all capped areas in OU3-5, supplemental bathymetric surveys will be performed only in "sentinel" capping areas following major river-flow events…that may have a significant impact on river hydrodynamics…Sentinel cap area monitoring will be performed within 1 year following a river flow (combined flood and seiche discharge) event with a recurrence interval of 20 years or more…Hourly average flows exceeding the 20-year return-interval flow rate (i.e., 21,000 cfs for OU3 and 22,100 cfs for OU4) will be used to trigger the supplemental bathymetric surveys. If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a 100-year flow event (e.g., 24,200 cfs for OU3 and 25,500 cfs for OU4; subject to future updates)." (Refer to the *COMMP* for more details regarding the calculation of the recurrence interval flow values.)

Flows near the mouth of the Fox River (including the combined effects of upstream floods and seiches) are measured approximately every 5 minutes at the U.S. Oil Tank Depot (USGS Station 040851385) (http://waterdata.usgs.gov/nwis/), which is the gauging station used for comparison of flow data to the appropriate recurrence intervals for OU4. Figure 1, in Attachment C, presents the 2014-2016 hourly moving averages as compared to the OU4 20-year and 100-year recurrence intervals. Using the hourly data for comparison (as required by the *COMMP*), the 20-year and the 100-year recurrence intervals were exceeded for OU4 during several time frames, as shown in the table and on the figure in Attachment C. The 20-year recurrence interval was first exceeded on April 18, 2015, and the 100-year recurrence interval was first exceeded on June 8, 2015. To further evaluate if at a minimum a 20-year flow event had occurred, the USGS mean daily discharge data were also reviewed, which showed a value of 21,700 cfs on December 14, 2015. This mean daily discharge further substantiates that a 20-year flow event likely occurred between the Year 0 and Year 2 surveys (data shown on the USGS figure in Attachment C).

Based on the requirements described above, sentinel cap area monitoring would have been required in OU4 in 2016. Because the routine Year 2 evaluation was also required in 2016, the LLC is proposing that this routine Year 2 evaluation also be used as the event-based monitoring for 20-year and 100-year flow events, noting that the evaluation is more comprehensive than required given that the evaluation covers all 52.3 acres, rather than just sentinel cap areas. Sentinel caps have not yet been identified for OU3 or OU4, but that effort is underway by the LLC and will be proposed to A/OT during the first quarter of 2017.

As a point of reference, due to the close proximity of the events, the A/OT also allowed use of the OU1 2011 5-year flow-event cap assessment to address the OU1 2012 routine cap monitoring event; for further detail refer to the April 19, 2013 memorandum *Lower Fox River OU1 Cap Monitoring Maintenance Plan 5-Year Flow Hydrographic Survey Comparison* (Foth, 2013).

Conclusions

Based upon the results of the Year 0 to Year 2 hydrographic survey comparison, the following conclusions can be made:

1. Results of the comparison of the Year 0 and Year 2 hydrographic surveys showed general cap settling, which resulted from consolidation of the underlying soft sediment, particularly in areas CC9, CB6-1-1, CB30, CB43, CB-33, CB45-1, CA23A-1, CA27AB, and CB89A. The poling/probing survey completed in all of these areas confirmed that the armor stone (quarry spall in the case off CC9) is present at all locations measured. The results of this survey provide high confidence (exceeding 95%) that the placed armored caps are present and performing as designed. Further, the identified settlement resulting from the consolidation of the underlying soft sediment for the OU4 caps is similar to the observed consolidation at the OU3 site.

2. Deposition (identified as an increase in top of cap elevation in 2016 over 2014) was noted in scattered areas throughout the cap regions, particularly in Cap Area CB39 and surrounding area in CB39-1-1. Deposition in this area is expected due to the decrease in river flow caused by the widening of the river channel downstream of the De Pere Dam. Less substantial deposition occurred in areas in which deposition would be expected, including along the shoreline, at the toe of slope, and in depressions.

3. A direct comparison of the 2014 and 2016 hydrographic surveys indicates there are several CCUs for which greater than 5% of the area has decreased in elevation, beyond the range of the combined survey vertical uncertainty level. This is the case for CBD23-1, CB6-1-1, CC9, CB30, CAD118, CA80A-1, CA80B-1, CB43, CB33, CB45-1, CA23A-1, CB45-2, CB45-3, CA24B-2, CA24C, CA27AB, CB89A and CA89B. Physical poling/probing confirmed the armor stone remains present. Settling of the top elevation of these caps is therefore attributed to consolidation of the underlying soft sediment.

4. Implementation of the Year 0 to Year 2 cap monitoring in OU4 indicates that the 52.3 areas of OU4 caps have remained in place, consistent with their design. Following completion of the 2016 cap monitoring, there is no indication of need for additional investigation of the integrity of the caps or for repair.

5. Based on the available flow data from the USGS for the Fox River, OU4, we conclude that both the 20-year and 100-year flow values occurred in 2015, triggering a flow-event assessment of caps in OU4. The Year 2 evaluation confirmed that caps placed during 2013-2014 in OU4 remained intact and are functioning as designed following these events.

   As stated in the COMMP, "If cap integrity and performance are verified under a 20-year flow event, follow-on event-based cap monitoring will occur following a 100-year flow event (e.g., 25,500 cfs for OU4)."

6. The LLC anticipates working collaboratively with the A/OT during the first quarter of 2017 to establish sentinel cap areas to be monitored during flow-induced *COMMP* events.

   Since the caps placed in OU4 during 2013-2014 have remained in place, consistent with their design, following occurrences of both 20 and 100-year flow events, the LLC will only perform future flow-event based monitoring of sentinel caps following 100-year flow events, consistent with *COMMP* requirements.

7. Based on the *COMMP* schedule established by the A/OT, the next routine cap monitoring survey for caps placed in 2013-2014 in OU4 (Year 4) will occur in 2018.

8. Based on the *COMMP* schedule established by the A/OT, the next routine cap monitoring survey for caps placed in 2015-2017 in OU4 (Year 0) will occur in 2017.

9. Based on the *COMMP* schedule established by the A/OT, the next routine cap monitoring survey for caps placed in OU3 (Year 7) will occur in 2018.

References

Anchor QEA, LLC and Tetra Tech EC, Inc., 2009. *Lower Fox River Remedial Design Cap Operations, Maintenance, and Monitoring Plan*. Prepared for Appleton Papers Inc., Georgia-Pacific Consumer Products LP, and NCR Corporation. April 2009.

Conover, W.J, 1999. *Practical Nonparametric Statistics, Third Edition*. John Wiley & Sons, Inc., New York.

Foth Infrastructure & Environment, LLC, 2010. *Lower Fox River OU1 Cap Monitoring Maintenance Plan - Hydrographic Survey Comparison - 455 kHz vs. 200 kHz Multi-Beam Bias* (Nov. 2010). Foth technical memorandum dated November 2010.

Foth Infrastructure & Environment, LLC, 2013. *Lower Fox River OU1 Cap Monitoring Maintenance Plan 5-Year Flow Hydrographic Survey Comparison.* Foth memorandum dated April 19, 2013.

Foth Infrastructure & Environment, LLC, 2015. *Lower Fox River OU3 COMMP Cap Integrity Assessment - Year 3*. Foth memorandum dated April 1, 2015.

Foth Infrastructure & Environment, LLC, 2015. *LFR OU4 COMMP Hydrographic Survey-Year Zero*. Foth memorandum dated June 22, 2015.

Tetra Tech EC, Inc.; Anchor Environmental, L.L.C.; J.F. Brennan Company, Inc.; and Boskalis Dolman, 2009. *Lower Fox River Remedial Design 100 Percent Design Report,* Volume 1. Prepared for Appleton Papers Inc., Georgia-Pacific Consumer products LP, and NCR Corporation. April 2009.

Tetra Tech EC, Inc.; Anchor Environmental, L.L.C.; J.F. Brennan Company, Inc.; and Stuyvesant Projects Realization Inc. (formerly Stuyvesant Dredging Inc., a subsidiary of Boskalis Dolman bv), 2016. *Quality Assurance Project Plan for Remedial Action of Operable Units 2, 3, 4, and 5 Lower Fox River and Green Bay Site, Revision 2.* July 2016.

National Oceanic and Atmospheric Administration (NOAA), 2016. NOAA/NOS/CO-OPS Observed Water Levels at 9087079, Green Bay, WI. Retrieved December 19, 2016, from https://www.co-ops.nos.noaa.gov/waterlevels.html?id=9087079

U.S. Geological Survey, 2016. USGS Surface-Water Historical Instantaneous Data for the Nation. Retrieved November 30, 2016, from http://waterdata.usgs.gov/nwis/

Table

Table 1
Upper OU4 COMMP Cap Integrity Assessment History

Location	Area (Acres)	Year Cap Completed	Routine Monitoring Event	Evaluation	Recommendation	Follow-up Action
CBD23-1047	0.47	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CBD23-1	0.49	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Two triangular-shaped depression areas are visible in the mudline elevations in CBD23-1 (Figure 2B). No abrupt change in elevation is found, however, when comparing to the isopach difference figure (Figure 2C). Therefore, the depressed areas on Figure 2B are likely a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
CB39-1-1/CB39	5.65	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The isopach difference (Figure 2C) indicates that the 2016 survey is higher than the 2014 survey by 1.0-2.0' in a large portion of CB39 and the surrounding areas in CB39-1-1. Poling/probing measurements confirm that deposition of sediment has occurred in these areas of a similar magnitude as that indicated in the survey, as shown on Figure 2C. The poling/probing evaluation determined soft sediment exists over the cap armor stone.	Cap maintenance not required.	N/A
D24-RDMU1	2.06	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The 2016 top of cap elevations in D24-RDMU1 (Figure 3B) appear highly irregular. No abrupt change in elevation is found, however, when comparing to the isopach difference figure (Figure 3C). To further confirm the integrity of the cap, a cross-section was cut through the area (Figure 3D). The 2014 and 2016 surveys follow a similar contour confirming that the irregularity seen on Figure 3B is a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
D24-RCMU3	0.39	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CC9	0.48	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Caps containing small depressed areas in which the 2016 top of cap elevation was 0.5-1.0' lower than the 2014 top of cap elevation were prevalent, and due to the isolated occurrences and locations of the depressed areas within the caps, integrity of these caps is not anticipated to be a concern. However, caps with a large portion of the area lower in elevation by 0.5-1.0', as in CC9, required additional evaluation. The soft sediment underlying Cap CC9 are expected to consolidate more in response to the additional loading of quarry spall and overall thickness of the C-cap. To confirm the integrity of the cap in this area, a cross-section was cut through CC9 (Figure 3D). The 2014 and 2016 surveys follow a similar contour indicating that the depression is likely due to consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor rock.	Cap maintenance not required.	N/A
CFIK-007	0.08	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB6-1-1	4.28	2013	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	A depression area is visible in the mudline elevations along the northern edge of CB6-1-1 (Figure 3B). No abrupt change in elevation is found, however, with this area when viewing the same areas in the isopach difference figure (Figure 3C). Therefore, the depressed area on Figure 3B is likely a reflection of the river bottom topography. To further confirm the integrity of the cap in this area, a cross-section was cut through the depressed area (Figure 3D). The 2014 and 2016 surveys follow a similar contour confirming that the depressed area on Figure 3B is a reflection of the river bottom topography. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
CBD23-27	0.46	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The top of cap elevations along the southern edge of CBD23-27 (Figure 4B) dips toward the south; however, the isopach difference (Figure 4C) indicates that the 2016 elevations are higher than the 2014 elevations by 0.5-1.5'. Therefore, this area reflects a depositional location. The poling/probing evaluation determined soft sediment exists over the cap armor stone.	Cap maintenance not required.	N/A

Table 1
Upper OU4 COMMP Cap Integrity Assessment History

Location	Area (Acres)	Year Cap Completed	Routine Monitoring Event	Evaluation	Recommendation	Follow-up Action
CBD23-34	0.71	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB40-1	0.14	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA61A-1	0.33	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA61C-1	0.12	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA61D-1	0.08	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB30	5.88	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The isometric view for the top of cap elevations for CAD118 and the portion of CB30 east of CAD118 (Figure 6B) appeared irregular; therefore, a cross-section was cut through these areas (Figure 6D) to confirm cap integrity. The isopach difference (Figure 6C) did not show similar irregularities and the 2014 and 2016 surveys follow similar and parallel contours indicating that the irregularity is likely a reflection of the river bottom topography and consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
CA87	0.23	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CAD118	0.41	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The isometric view for the top of cap elevations for CAD118 and the portion of CB30 east of CAD118 (Figure 6B) appeared irregular; therefore, a cross-section was cut through these areas (Figure 6D) to confirm cap integrity. The isopach difference (Figure 6C) did not show similar irregularities and the 2014 and 2016 surveys follow similar and parallel contours indicating that the irregularity is likely a reflection of the river bottom topography and consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
CA80A-1	0.15	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA80B-1	0.30	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA77B-1	0.14	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB9A-1	0.15	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB43	4.54	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CBD27A-1	0.63	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CBD27A-2	0.13	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A

Table 1
Upper OU4 COMMP Cap Integrity Assessment History

Location	Area (Acres)	Year Cap Completed	Routine Monitoring Event	Evaluation	Recommendation	Follow-up Action
CA63D	0.16	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CAD27A-3	0.09	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA63C	0.43	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA67	0.60	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB33	2.72	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	The isometric view for the top of cap elevations for CB33 (Figure 9B) appeared irregular and several depressed areas 0.5-1.5' were apparent in the isopach difference (Figure 9C); therefore, a cross-section was cut through the area (Figure 9D) to confirm cap integrity. The 2014 and 2016 surveys follow similar and parallel contours indicating that the irregularity is likely a reflection of the river bottom topography and consolidation of the underlying soft sediment. In addition, the poling/probing evaluation confirms the existence of armor stone in these areas.	Cap maintenance not required.	N/A
CB11A-1	0.76	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB45-1	3.47	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.	Cap maintenance not required.	N/A
CA23A-1	0.30	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.	Cap maintenance not required.	N/A
CA24B-1	1.37	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA24B-2	1.59	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.	Cap maintenance not required.	N/A

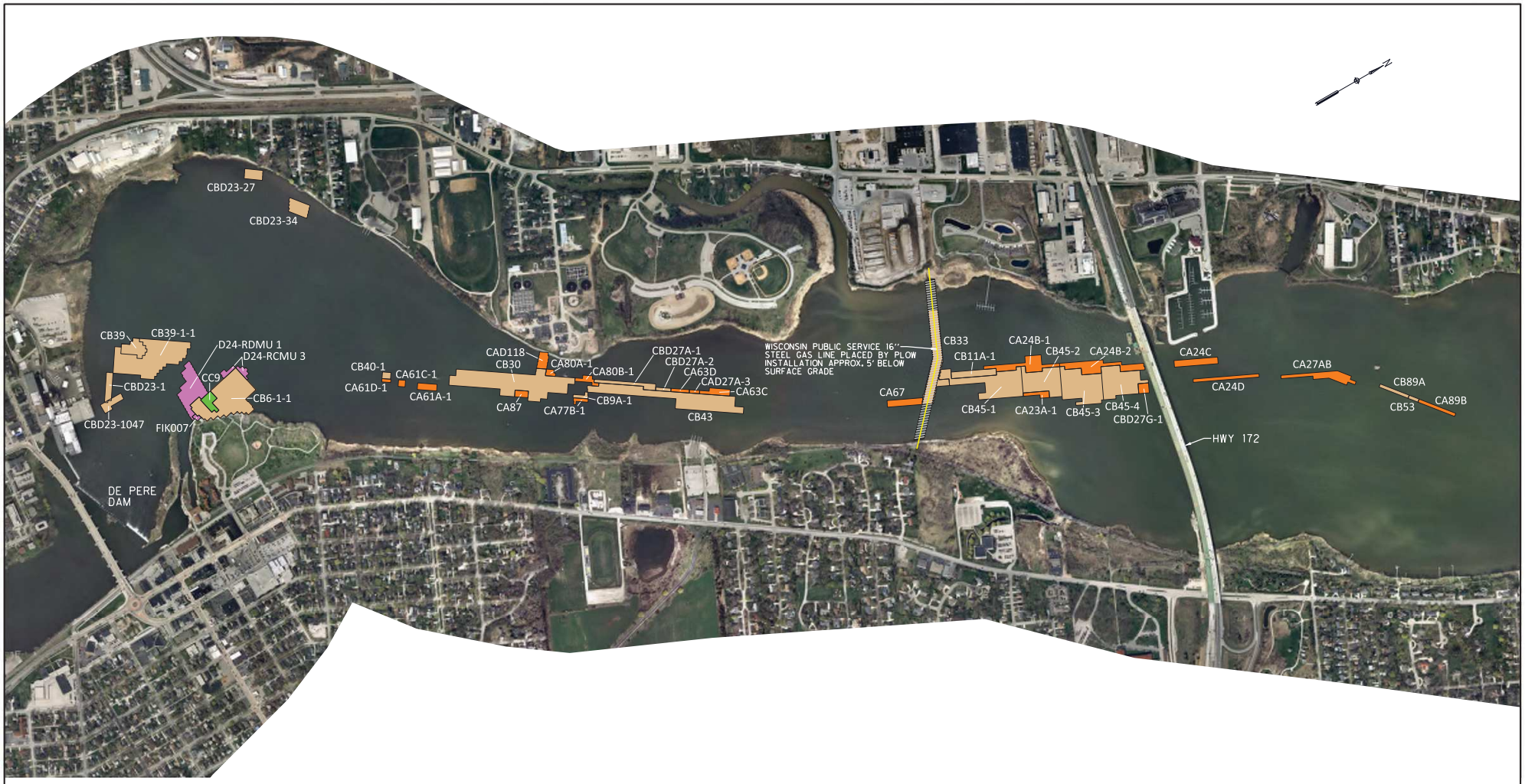
Table 1
Upper OU4 COMMP Cap Integrity Assessment History

Location	Area (Acres)	Year Cap Completed	Routine Monitoring Event	Evaluation	Recommendation	Follow-up Action
CB45-2	2.39	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.	Cap maintenance not required.	N/A
CB45-3	3.23	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	Similar to CC9, contiguous cap areas CB45-1, CB45-2, and CA23A-1 (Figure 10C), as well as CB45-3 and the eastern portion of CA24B-2 (Figure 11C), contained relatively large areas in which the 2016 survey was lower than the 2014 survey by 0.5-1.0'. To confirm cap integrity, a cross-section was cut through CB45-1 as a representative section for these areas (Figure 10D). The 2014 and 2016 surveys follow a similar contour, though the 2016 survey is lower throughout CB45-1, indicating that the depressed areas are likely due to consolidation of underlying soft sediment. In addition, the poling/probing evaluation confirms the presence of the armor stone in these areas.	Cap maintenance not required.	N/A
CB45-4	2.70	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CBD27G-1	0.27	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA24C	0.74	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA24D	0.56	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA27AB	1.11	2014	Year 0 (2014)	Linear irregularities are evident in the isometric view on the north east end of the cap. Foth investigated the potential causes for these linear irregularities and found that multiple dredging and/or capping/covering pipelines were traversing this cap area at the time of the survey data collection.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB53	0.09	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CB89A	0.26	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
CA89B	0.33	2014	Year 0 (2014)	No irregularities noted.	Cap maintenance not required.	N/A
			Year 2 (2016)	No irregularities noted.	Cap maintenance not required.	N/A
OU4 COMMP Total 2013-2014	51.47					

N/A - Not Applicable

Prepared by: TMK1
Checked by: KMO

Figures



LEGEND

- CA87 — "A" CAP DESIGN PLACEMENT LOCATION AND IDENTIFICATION
- CB43 — "B" CAP DESIGN PLACEMENT LOCATION AND IDENTIFICATION
- CC9 — "C" CAP DESIGN PLACEMENT LOCATION AND IDENTIFICATION
- RESIDUAL CAP DESIGN PLACEMENT LOCATION AND IDENTIFICATION

NOTES:

1. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
2. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE COMPILED IN NOVEMBER 2010.
3. DESIGN CAP PLACEMENT LIMITS AND UTILITY LOCATIONS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

0 500' 1000'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 1

LOWER FOX RIVER - OU4
2014 CAP PLACEMENT LOCATIONS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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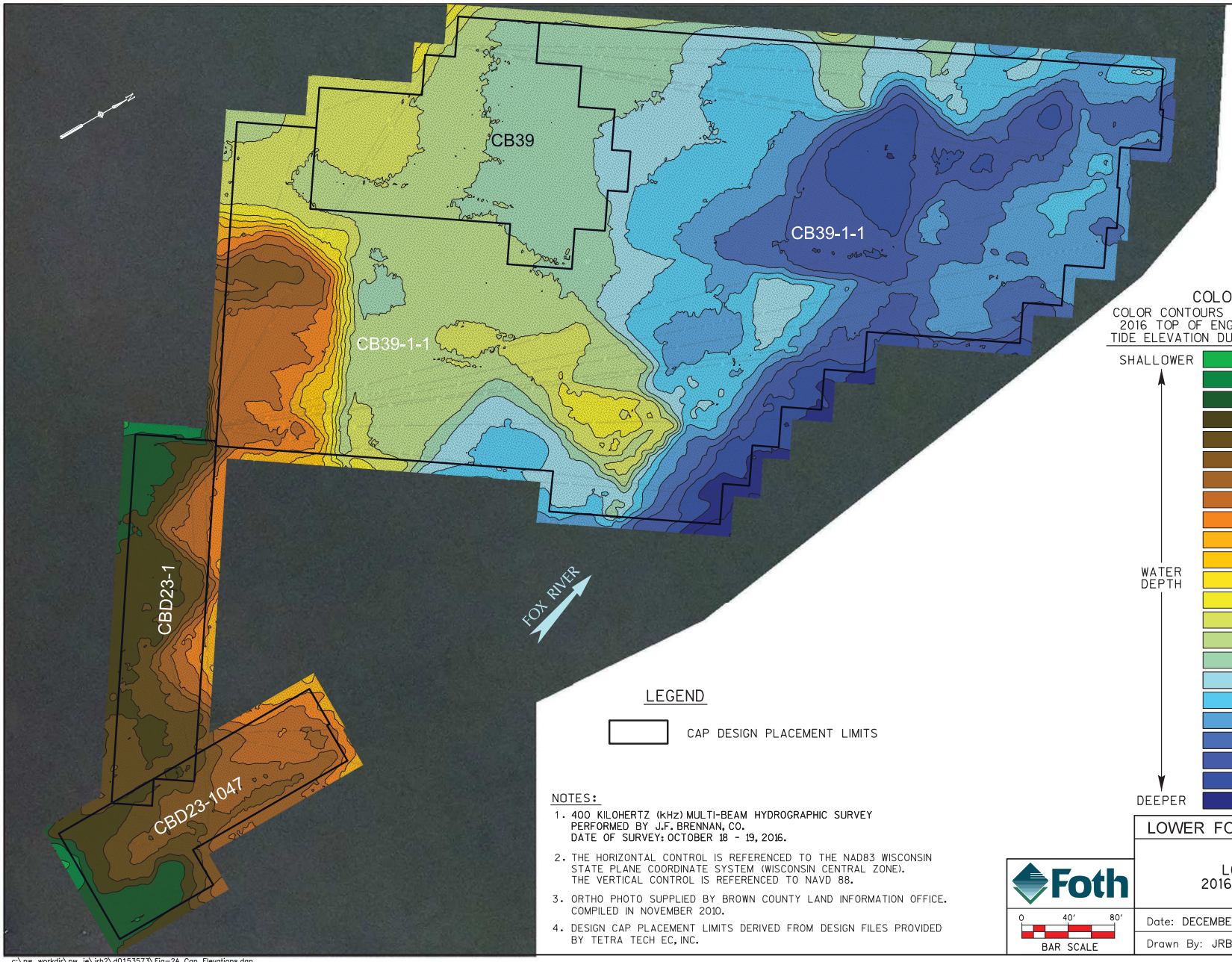

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

- ELEVATION 573 - 574
- ELEVATION 572 - 573
- ELEVATION 571 - 572
- ELEVATION 570 - 571
- ELEVATION 569 - 570
- ELEVATION 568 - 569
- ELEVATION 567 - 568
- ELEVATION 566 - 567
- ELEVATION 565 - 566
- ELEVATION 564 - 565
- ELEVATION 563 - 564
- ELEVATION 562 - 563
- ELEVATION 561 - 562
- ELEVATION 560 - 561
- ELEVATION 559 - 560
- ELEVATION 558 - 559
- ELEVATION 557 - 558
- ELEVATION 556 - 557
- ELEVATION 555 - 556
- ELEVATION 554 - 555
- ELEVATION 553 - 554
- ELEVATION 552 - 553
- ELEVATION 551 - 552

WATER DEPTH

DEEPER

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 2A

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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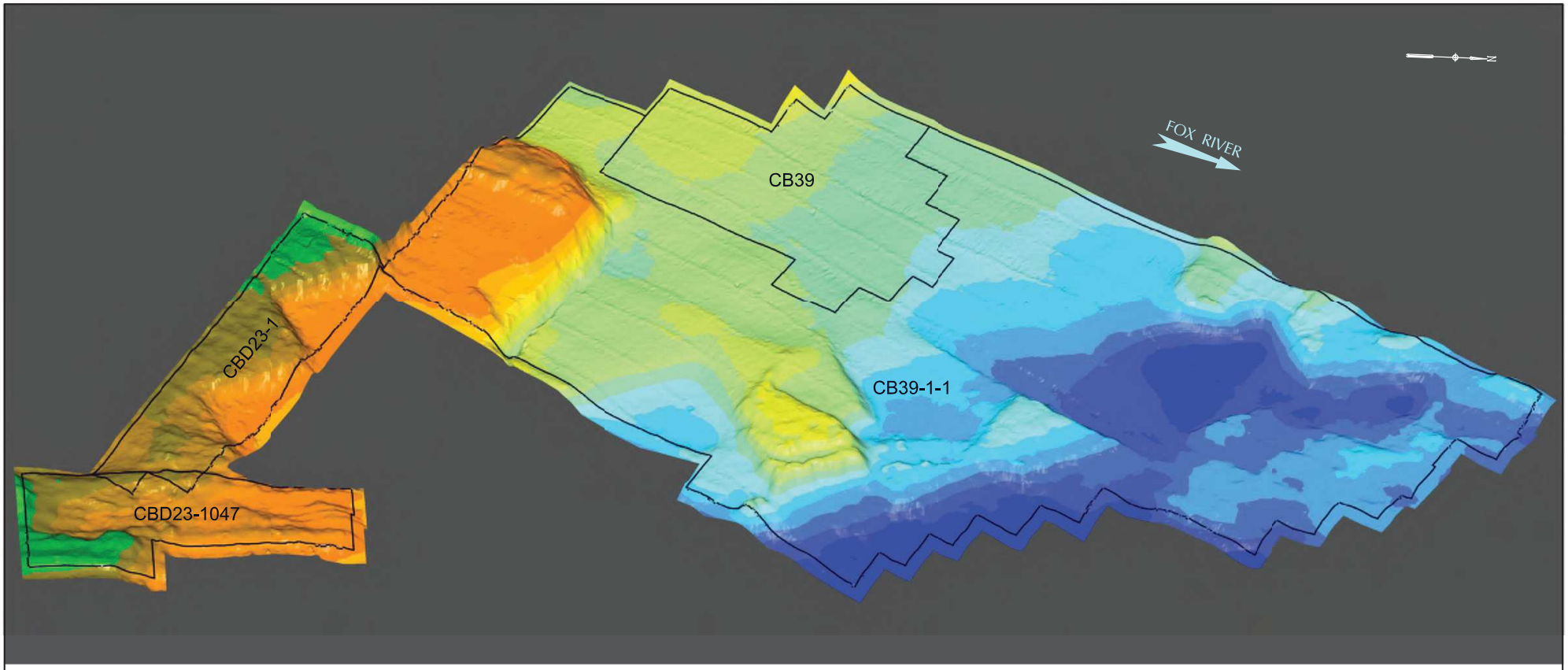

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER ↑ WATER DEPTH

- ELEVATION 573 - 574
- ELEVATION 572 - 573
- ELEVATION 571 - 572
- ELEVATION 570 - 571
- ELEVATION 569 - 570
- ELEVATION 568 - 569
- ELEVATION 567 - 568
- ELEVATION 566 - 567
- ELEVATION 565 - 566
- ELEVATION 564 - 565
- ELEVATION 563 - 564
- ELEVATION 562 - 563

WATER DEPTH ↓ DEEPER

- ELEVATION 561 - 562
- ELEVATION 560 - 561
- ELEVATION 559 - 560
- ELEVATION 558 - 559
- ELEVATION 557 - 558
- ELEVATION 556 - 557
- ELEVATION 555 - 556
- ELEVATION 554 - 555
- ELEVATION 553 - 554
- ELEVATION 552 - 553
- ELEVATION 551 - 552

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 2B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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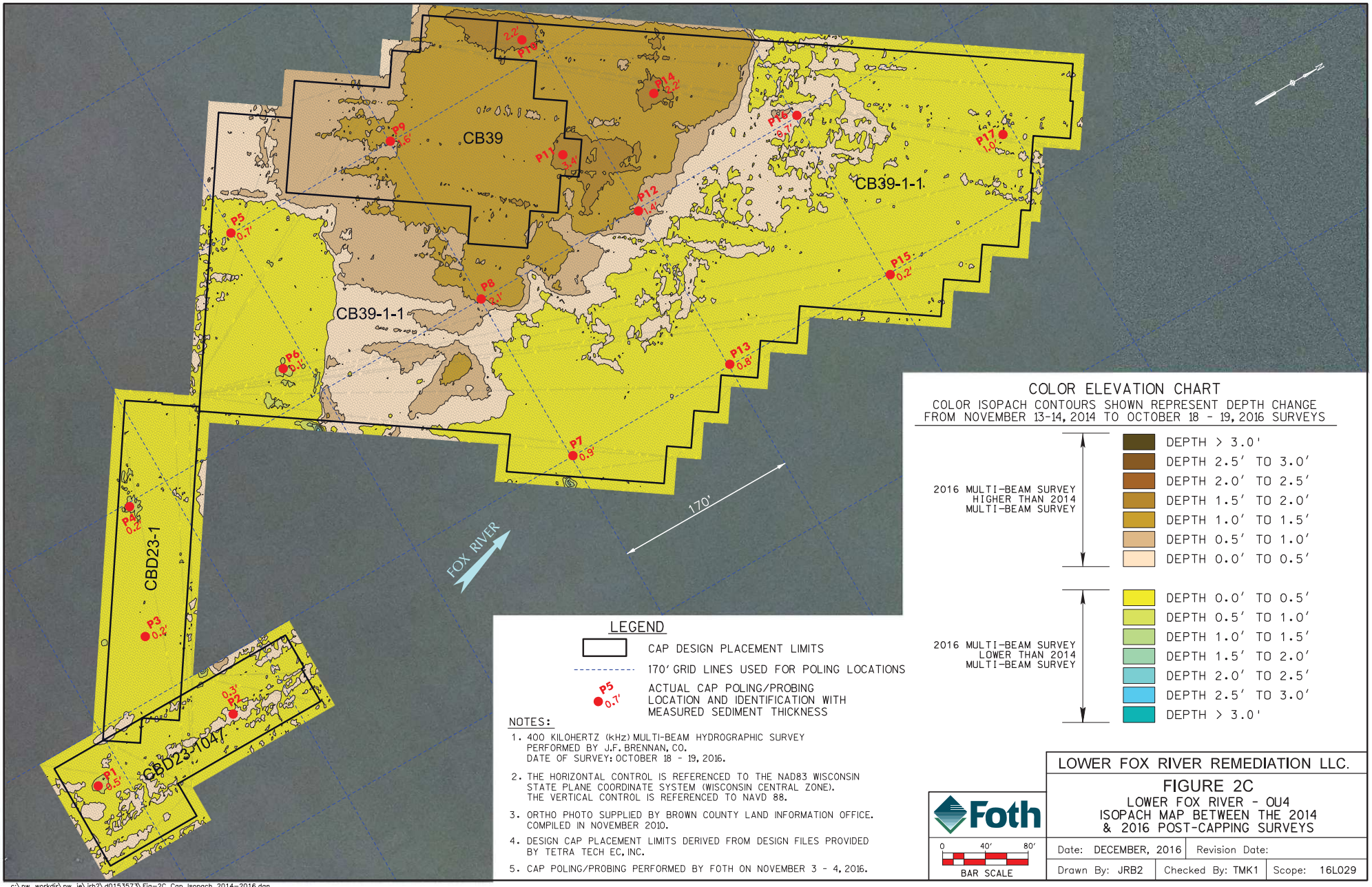

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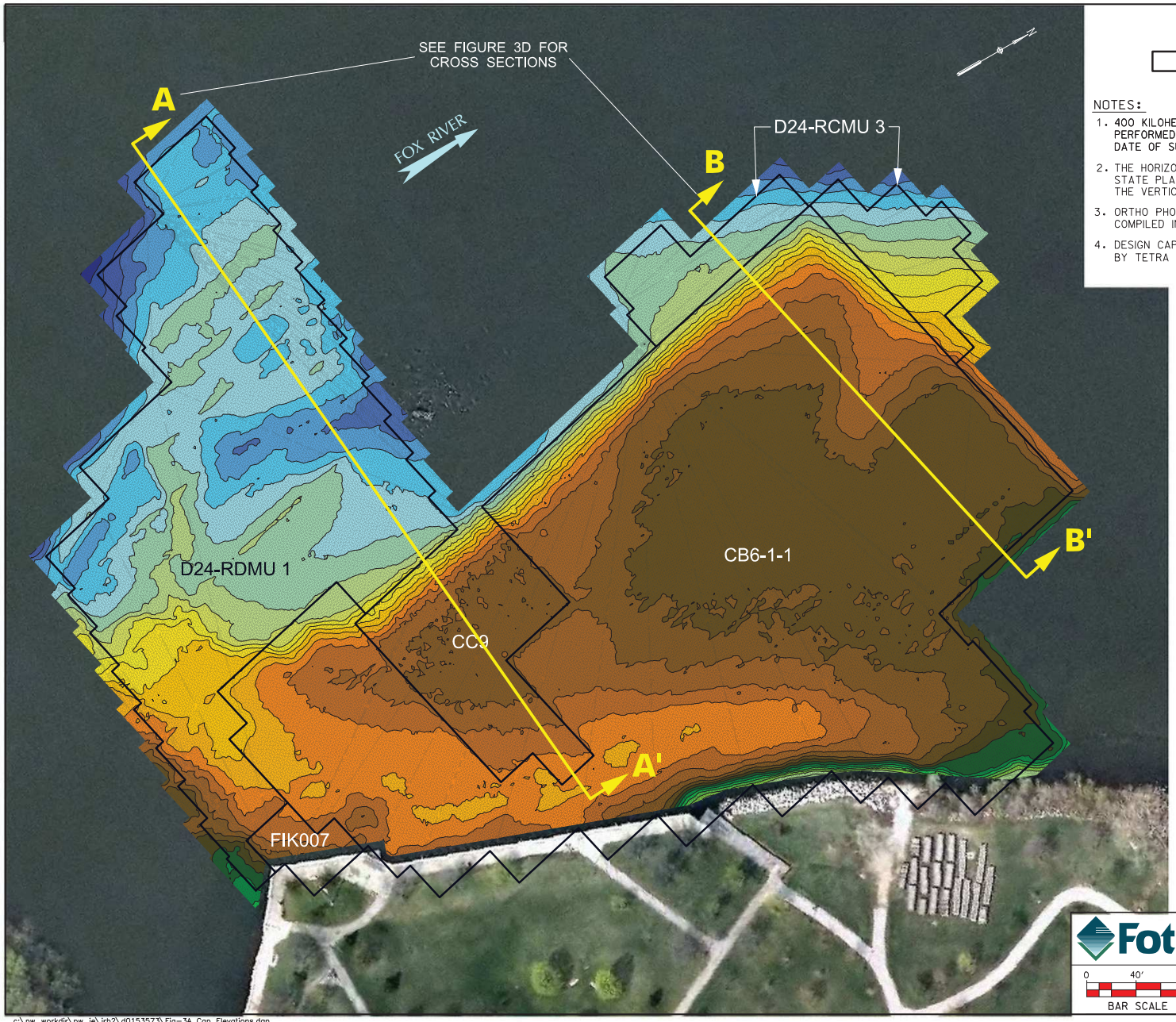

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

ELEVATION 575 - 576
ELEVATION 574 - 575
ELEVATION 573 - 574
ELEVATION 572 - 573
ELEVATION 571 - 572
ELEVATION 570 - 571
ELEVATION 569 - 570
ELEVATION 568 - 569
ELEVATION 567 - 568
ELEVATION 566 - 567
ELEVATION 565 - 566
ELEVATION 564 - 565
ELEVATION 563 - 564
ELEVATION 562 - 563
ELEVATION 561 - 562
ELEVATION 560 - 561
ELEVATION 559 - 560
ELEVATION 558 - 559
ELEVATION 557 - 558
ELEVATION 556 - 557
ELEVATION 555 - 556
ELEVATION 554 - 555
ELEVATION 553 - 554
ELEVATION 552 - 553
ELEVATION 551 - 552

WATER DEPTH

DEEPER

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 3A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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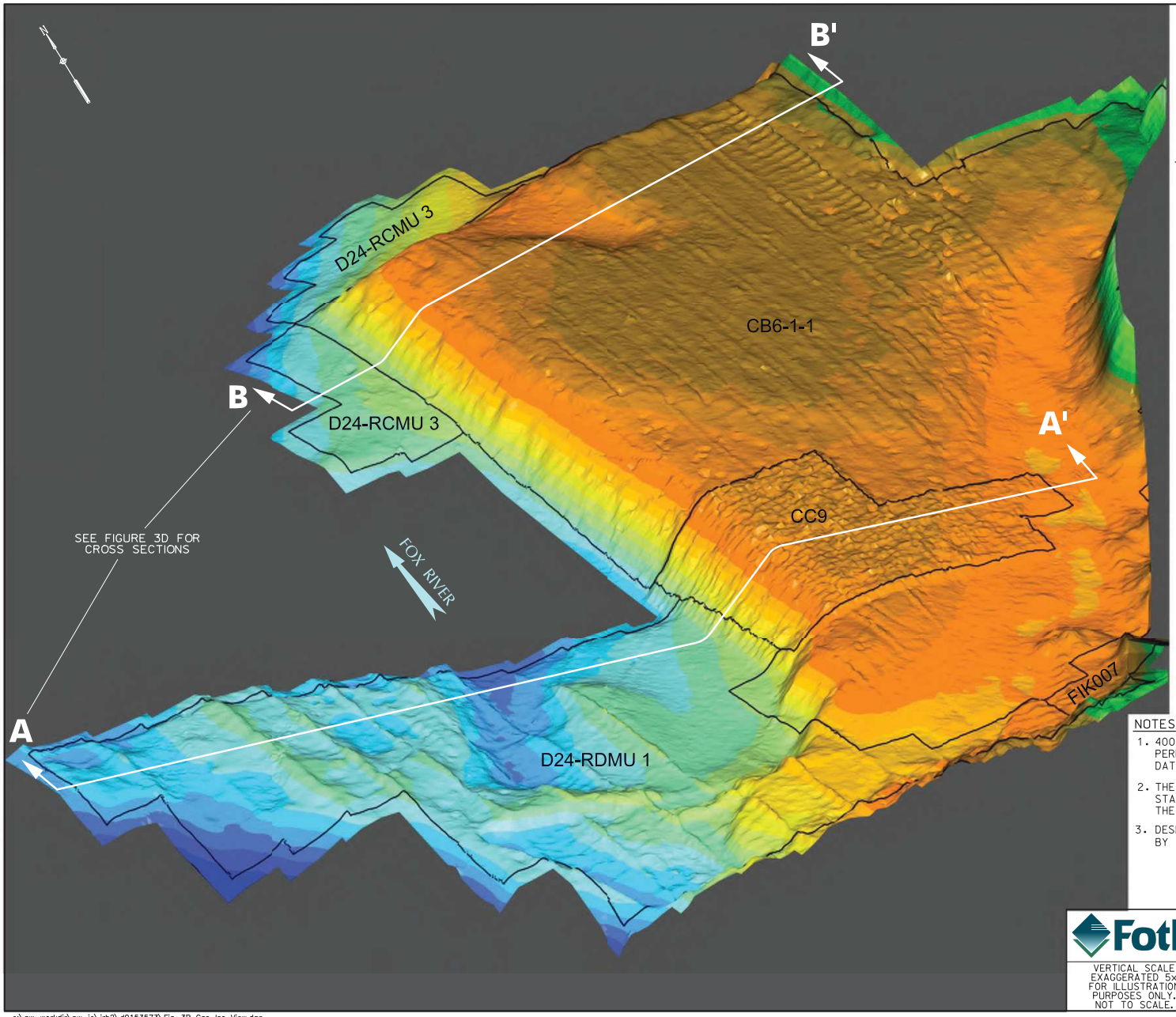

LEGEND

CAP DESIGN PLACEMENT LIMITS

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

ELEVATION 575 - 576
ELEVATION 574 - 575
ELEVATION 573 - 574
ELEVATION 572 - 573
ELEVATION 571 - 572
ELEVATION 570 - 571
ELEVATION 569 - 570
ELEVATION 568 - 569
ELEVATION 567 - 568
ELEVATION 566 - 567
ELEVATION 565 - 566
ELEVATION 564 - 565
ELEVATION 563 - 564
ELEVATION 562 - 563
ELEVATION 561 - 562
ELEVATION 560 - 561
ELEVATION 559 - 560
ELEVATION 558 - 559
ELEVATION 557 - 558
ELEVATION 556 - 557
ELEVATION 555 - 556
ELEVATION 554 - 555
ELEVATION 553 - 554
ELEVATION 552 - 553
ELEVATION 551 - 552

WATER DEPTH

DEEPER

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 3B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P32 0.0' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18 - 19, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 3C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: NOVEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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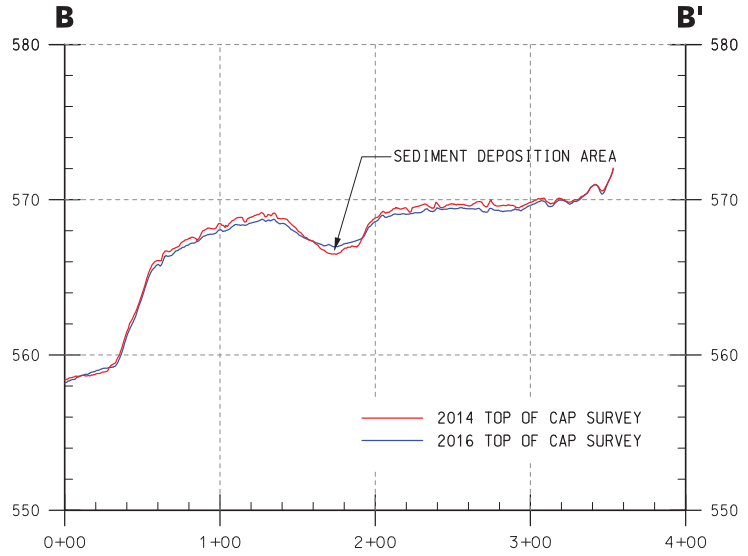

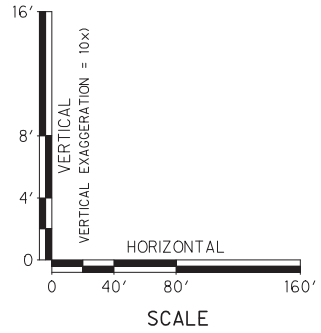

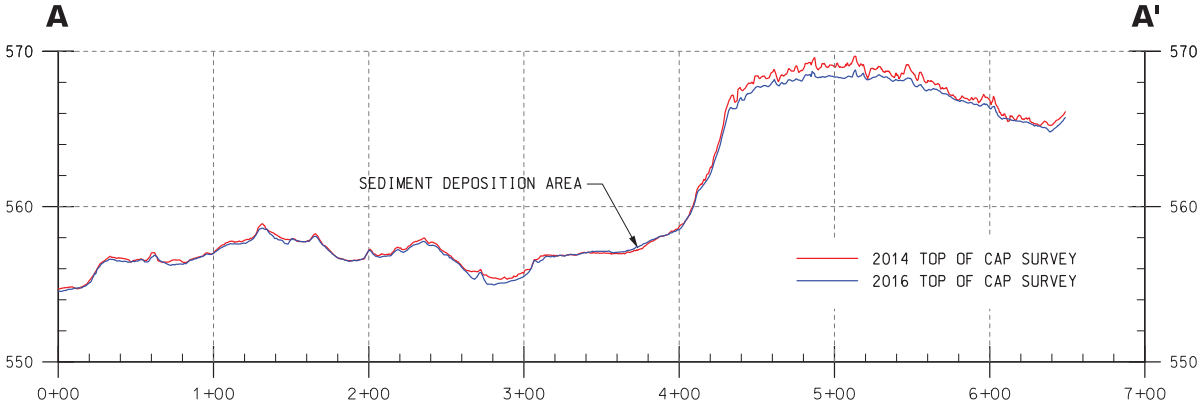

SEE FIGURES 3A, 3B & 3C FOR
CROSS SECTION LOCATIONS

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 3D

LOWER FOX RIVER - OU4
TOP OF CAP CROSS SECTIONS

Foth

SCALE: AS SHOWN

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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LEGEND

CAP DESIGN PLACEMENT LIMITS

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER	ELEVATION 576 - 577
	ELEVATION 575 - 576
	ELEVATION 574 - 575
	ELEVATION 573 - 574
WATER DEPTH	ELEVATION 572 - 573
	ELEVATION 571 - 572
	ELEVATION 570 - 571
	ELEVATION 569 - 570
	ELEVATION 568 - 569
DEEPER	ELEVATION 567 - 568

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 4A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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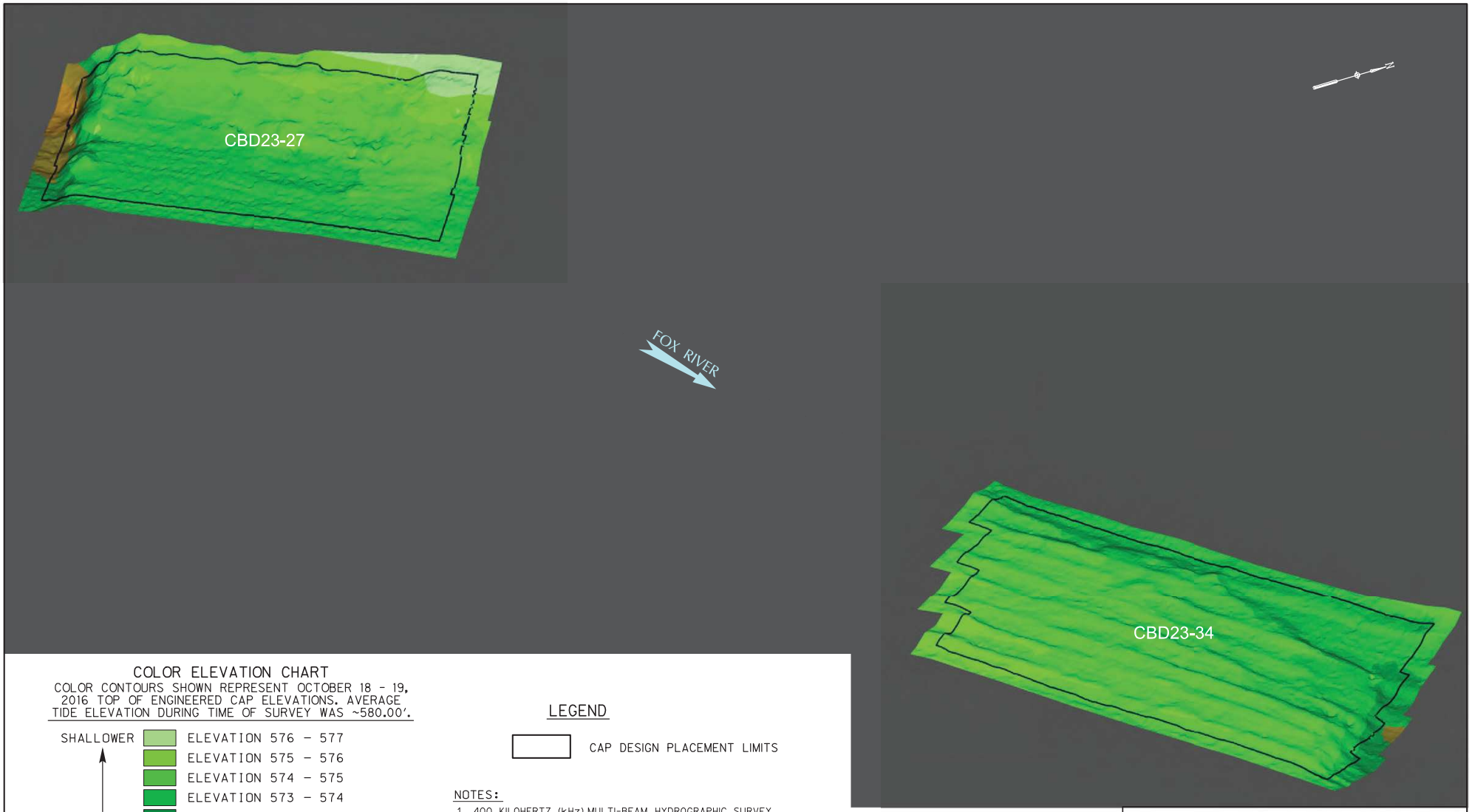

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

WATER DEPTH

DEEPER

- ELEVATION 576 - 577
- ELEVATION 575 - 576
- ELEVATION 574 - 575
- ELEVATION 573 - 574
- ELEVATION 572 - 573
- ELEVATION 571 - 572
- ELEVATION 570 - 571
- ELEVATION 569 - 570
- ELEVATION 568 - 569
- ELEVATION 567 - 568

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 4B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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LEGEND

CAP DESIGN PLACEMENT LIMITS

170' GRID LINES USED FOR POLING LOCATIONS

P40 0.3' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18, 19 & 25 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/ MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/ MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 4C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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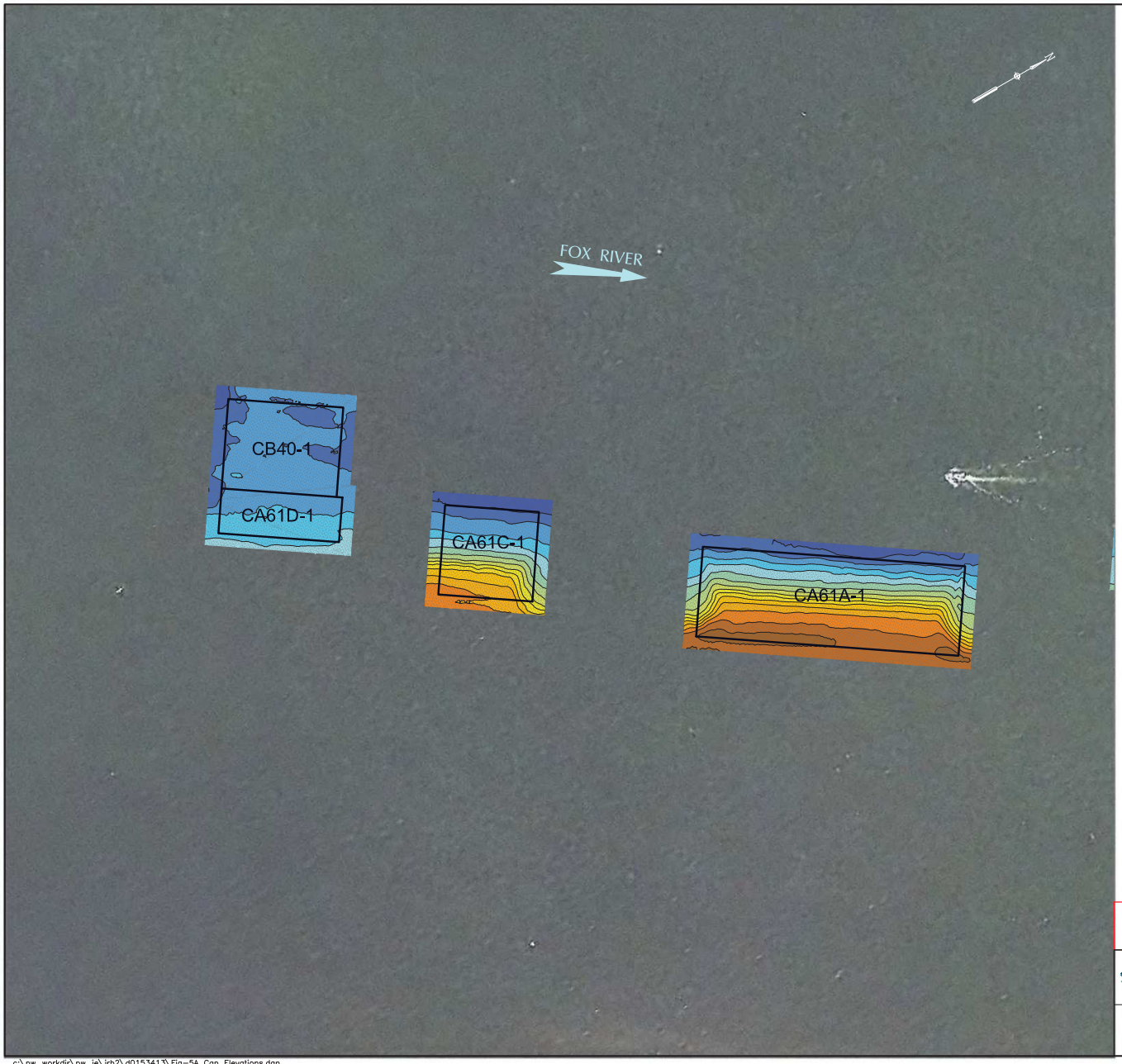

LEGEND

CAP DESIGN PLACEMENT LIMITS

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT 4-11, 4-20 & 5-3, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS 580.30'.

SHALLOWER	ELEVATION 567 - 568
	ELEVATION 566 - 567
	ELEVATION 565 - 566
	ELEVATION 564 - 565
	ELEVATION 563 - 564
	ELEVATION 562 - 563
	ELEVATION 561 - 562
WATER DEPTH	ELEVATION 560 - 561
	ELEVATION 559 - 560
	ELEVATION 558 - 559
	ELEVATION 557 - 558
	ELEVATION 556 - 557
	ELEVATION 555 - 556
	ELEVATION 554 - 555
DEEPER	ELEVATION 553 - 554

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

DRAFT

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 5A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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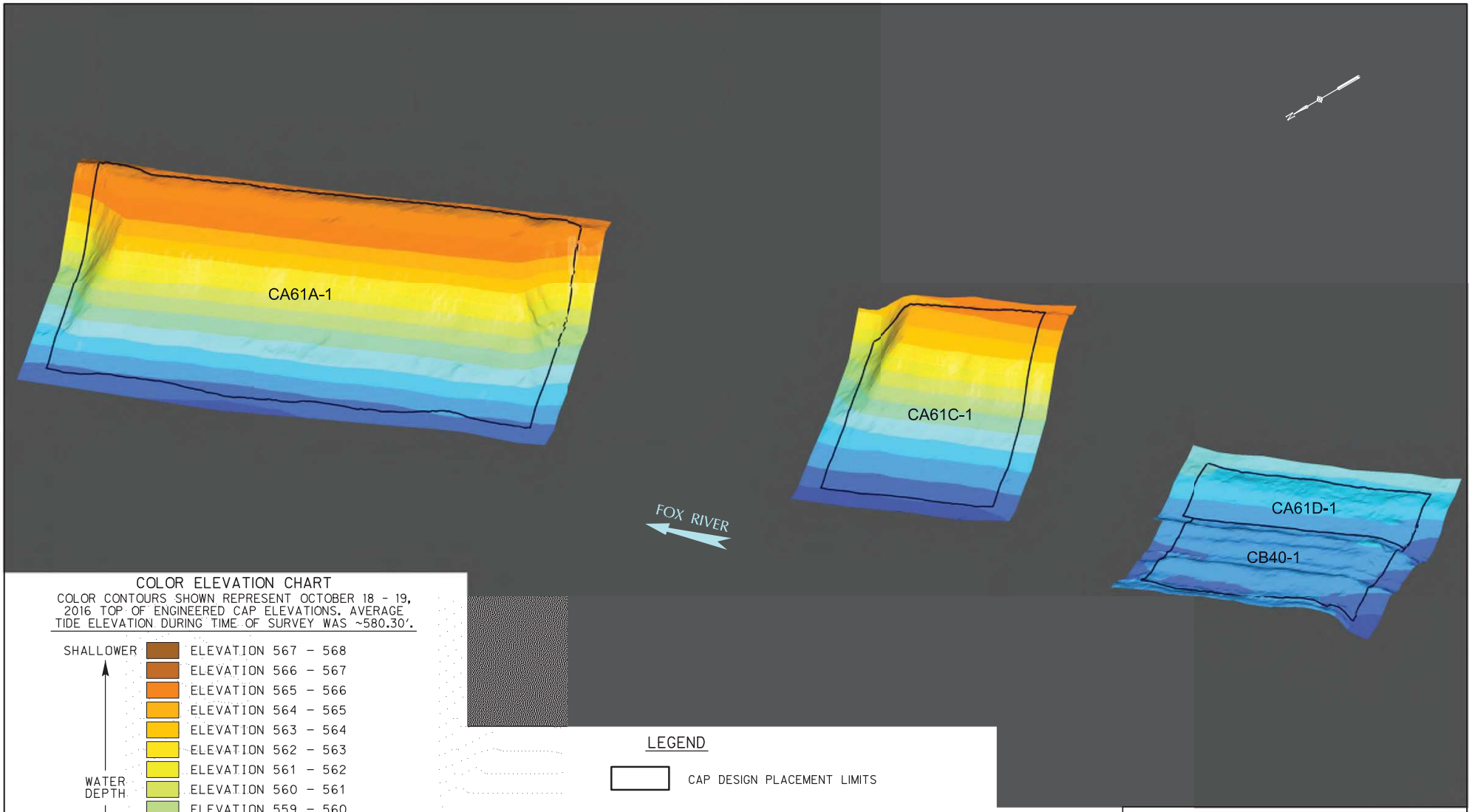

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.30'.

SHALLOWER	ELEVATION 567 - 568
	ELEVATION 566 - 567
	ELEVATION 565 - 566
	ELEVATION 564 - 565
	ELEVATION 563 - 564
	ELEVATION 562 - 563
	ELEVATION 561 - 562
WATER DEPTH	ELEVATION 560 - 561
	ELEVATION 559 - 560
	ELEVATION 558 - 559
	ELEVATION 557 - 558
	ELEVATION 556 - 557
	ELEVATION 555 - 556
	ELEVATION 554 - 555
DEEPER	ELEVATION 553 - 554

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 5B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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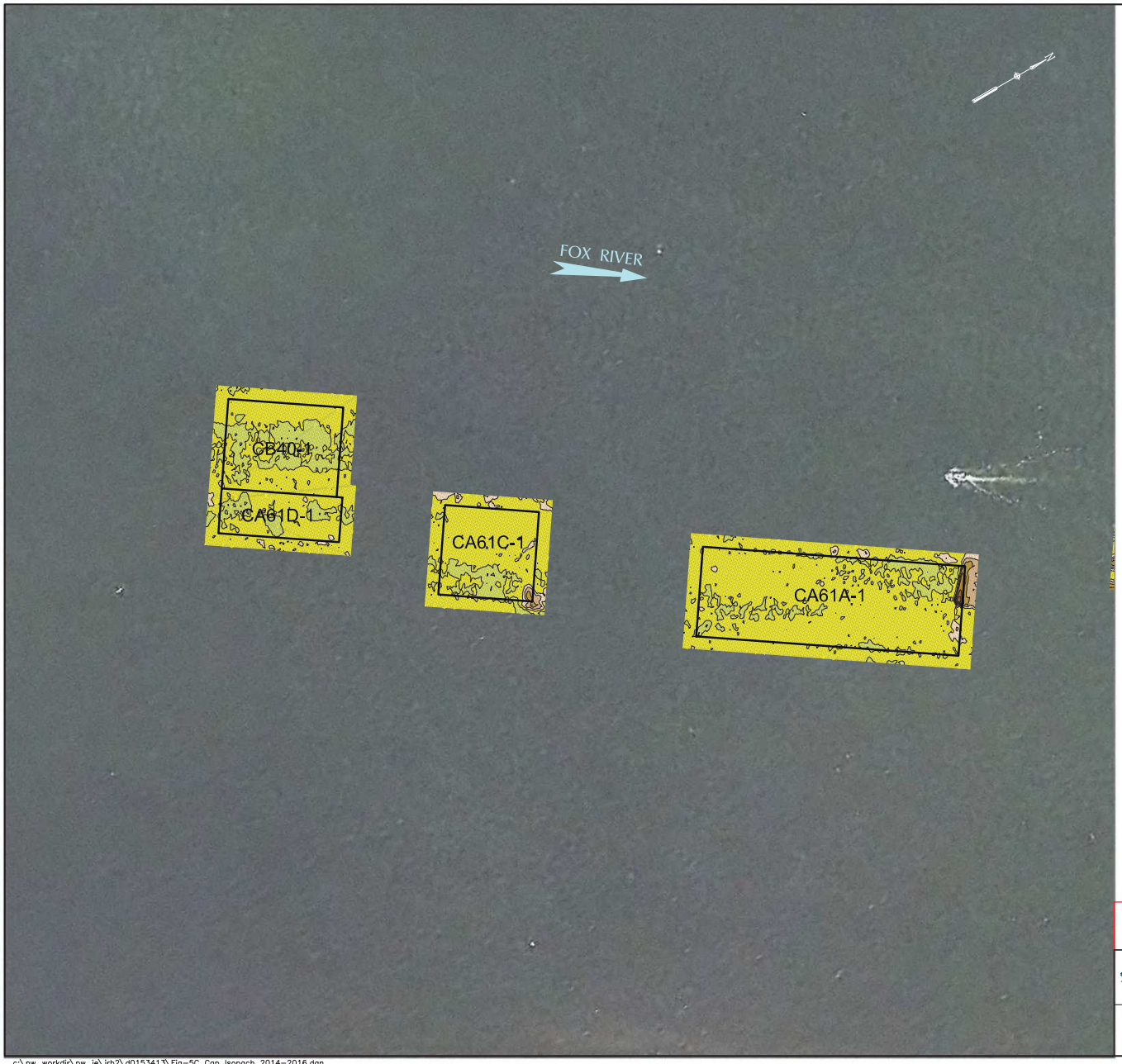

LEGEND

CAP DESIGN PLACEMENT LIMITS

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO APRIL 11, APRIL 20 AND MAY 3, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

DRAFT

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 5C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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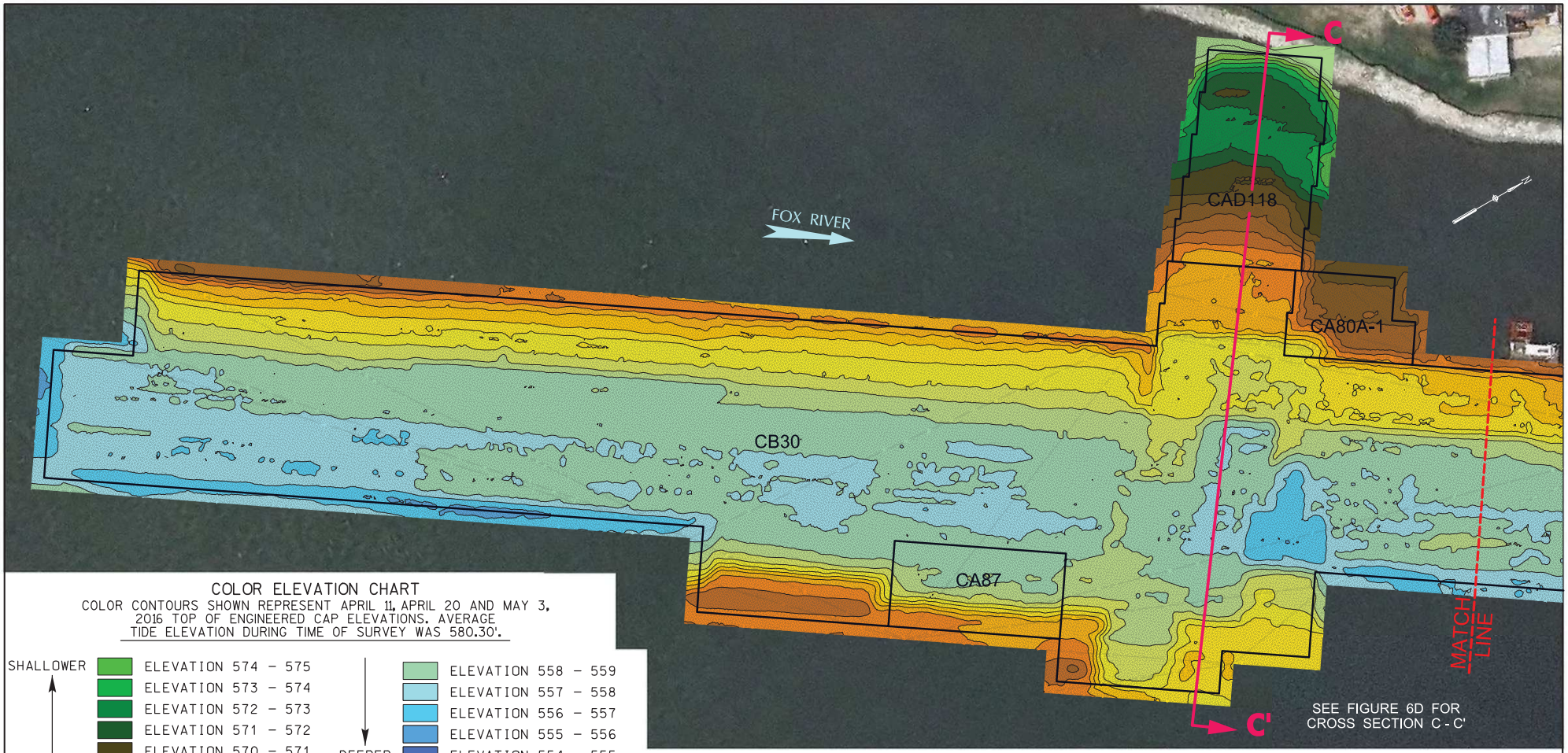

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT APRIL 11, APRIL 20 AND MAY 3, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS 580.30'.

SHALLOWER ↑ WATER DEPTH ↓ DEEPER

- ELEVATION 574 – 575
- ELEVATION 573 – 574
- ELEVATION 572 – 573
- ELEVATION 571 – 572
- ELEVATION 570 – 571
- ELEVATION 569 – 570
- ELEVATION 568 – 569
- ELEVATION 567 – 568
- ELEVATION 566 – 567
- ELEVATION 565 – 566
- ELEVATION 564 – 565
- ELEVATION 563 – 564
- ELEVATION 562 – 563
- ELEVATION 561 – 562
- ELEVATION 560 – 561
- ELEVATION 559 – 560
- ELEVATION 558 – 559
- ELEVATION 557 – 558
- ELEVATION 556 – 557
- ELEVATION 555 – 556
- ELEVATION 554 – 555

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

DRAFT

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 6A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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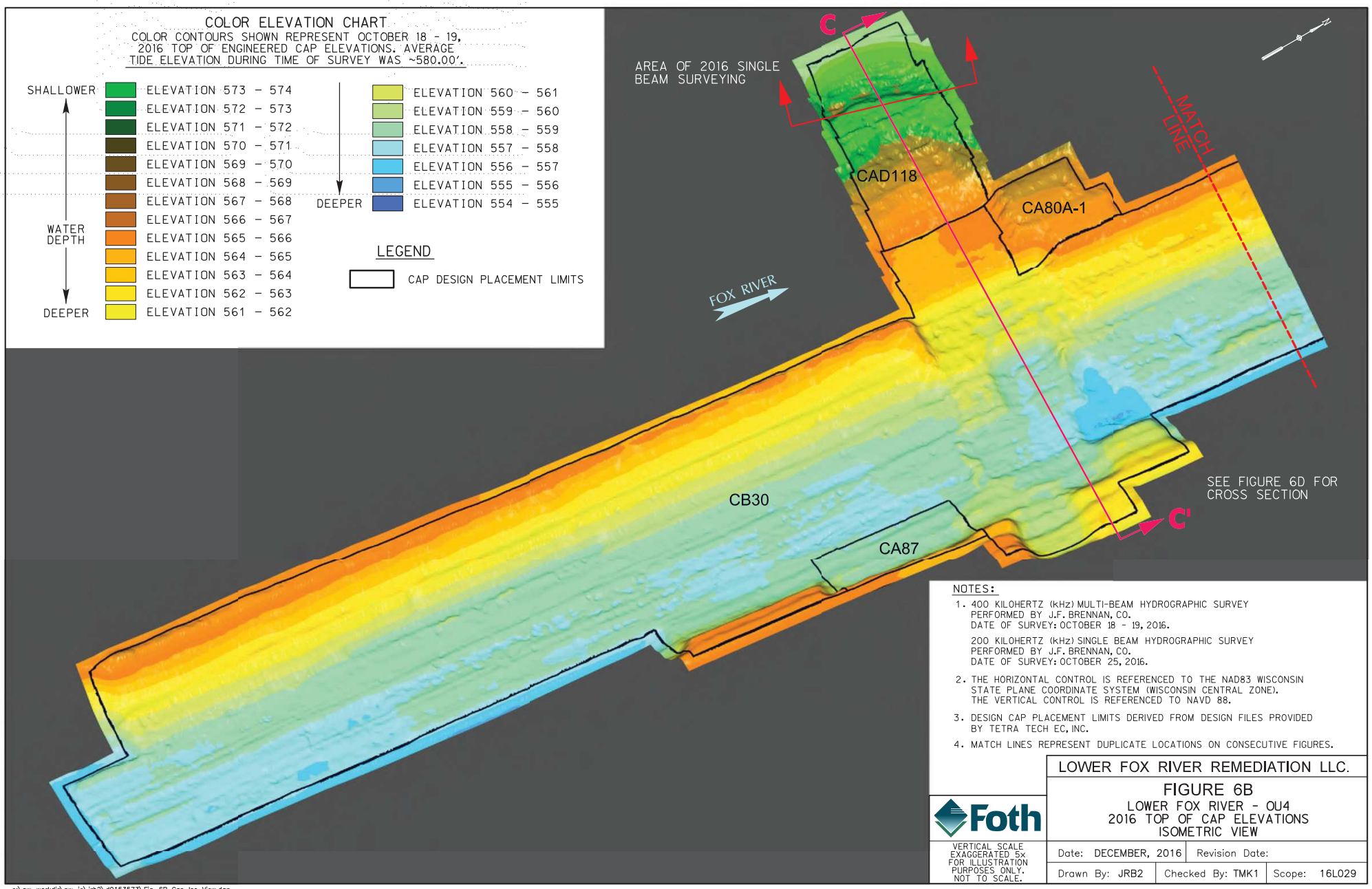

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 25, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 6B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO APRIL 11, APRIL 20 AND MAY 3, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 6C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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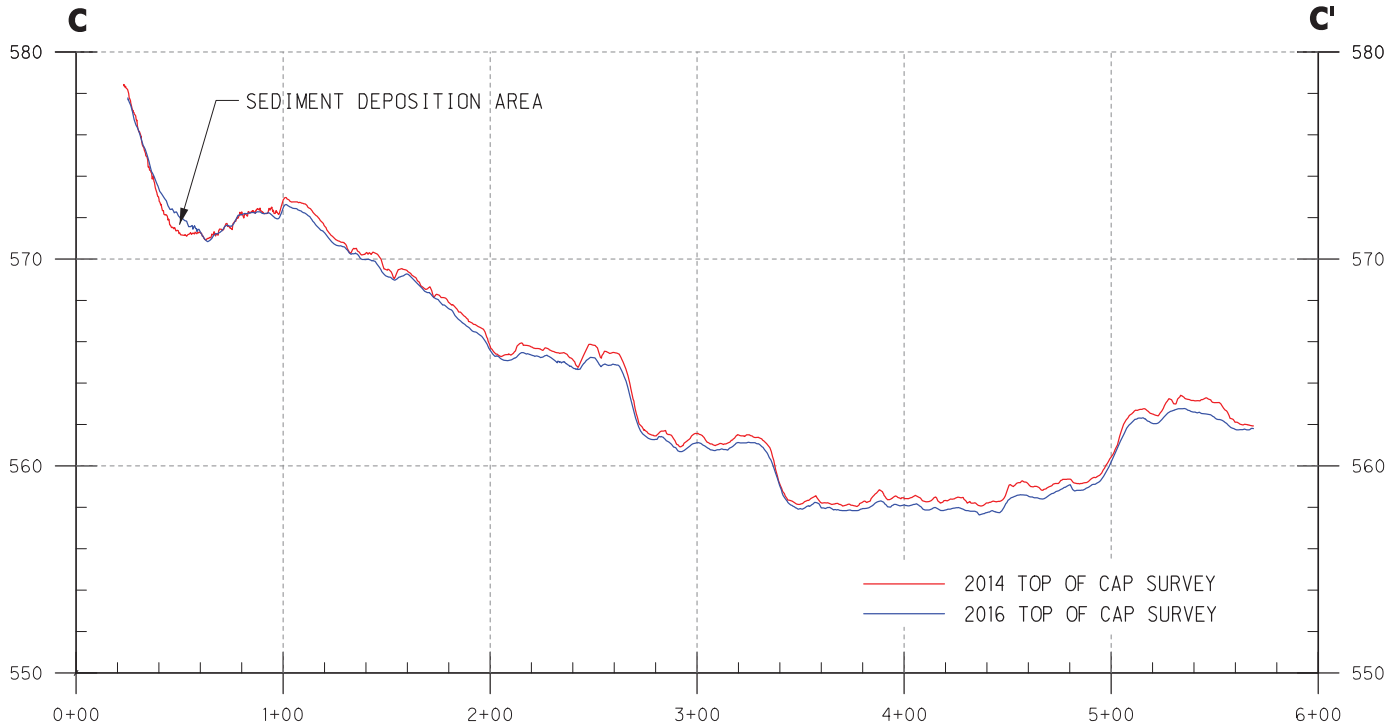

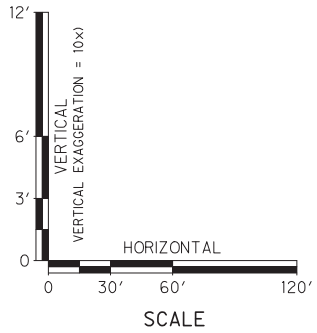

SEE FIGURES 6A, 6B & 6C FOR CROSS SECTION LOCATIONS

Foth

SCALE: AS SHOWN

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 6D

LOWER FOX RIVER - OU4
TOP OF CAP CROSS SECTIONS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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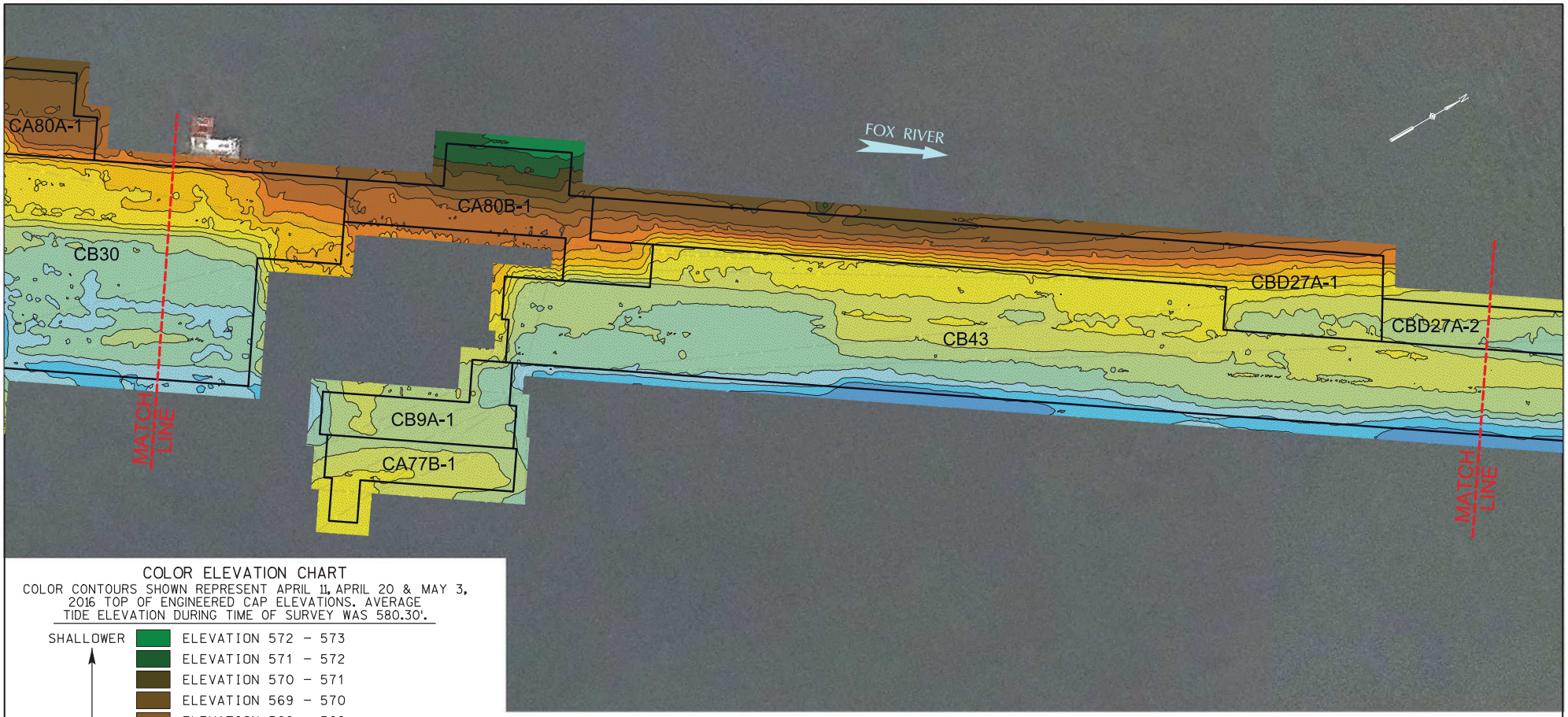

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT APRIL 11, APRIL 20 & MAY 3, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS 580.30'.

SHALLOWER		ELEVATION 572 – 573
		ELEVATION 571 – 572
		ELEVATION 570 – 571
		ELEVATION 569 – 570
		ELEVATION 568 – 569
		ELEVATION 567 – 568
		ELEVATION 566 – 567
		ELEVATION 565 – 566
WATER DEPTH		ELEVATION 564 – 565
		ELEVATION 563 – 564
		ELEVATION 562 – 563
		ELEVATION 561 – 562
		ELEVATION 560 – 561
		ELEVATION 559 – 560
		ELEVATION 558 – 559
		ELEVATION 557 – 558
		ELEVATION 556 – 557
DEEPER		ELEVATION 555 – 556

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 7A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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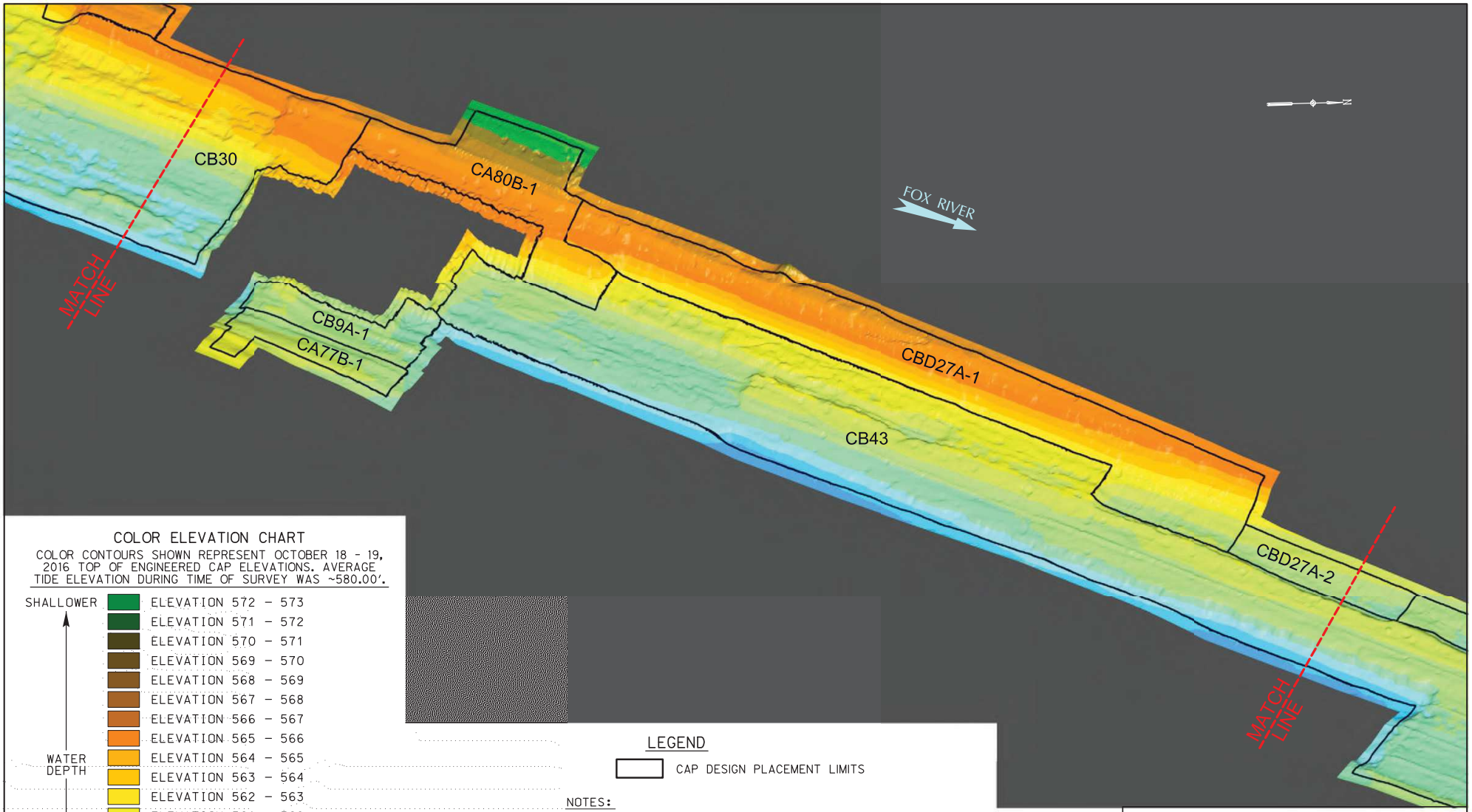

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER	ELEVATION 572 - 573
	ELEVATION 571 - 572
	ELEVATION 570 - 571
	ELEVATION 569 - 570
	ELEVATION 568 - 569
	ELEVATION 567 - 568
	ELEVATION 566 - 567
	ELEVATION 565 - 566
WATER DEPTH	ELEVATION 564 - 565
	ELEVATION 563 - 564
	ELEVATION 562 - 563
	ELEVATION 561 - 562
	ELEVATION 560 - 561
	ELEVATION 559 - 560
	ELEVATION 558 - 559
	ELEVATION 557 - 558
	ELEVATION 556 - 557
DEEPER	ELEVATION 555 - 556

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 7B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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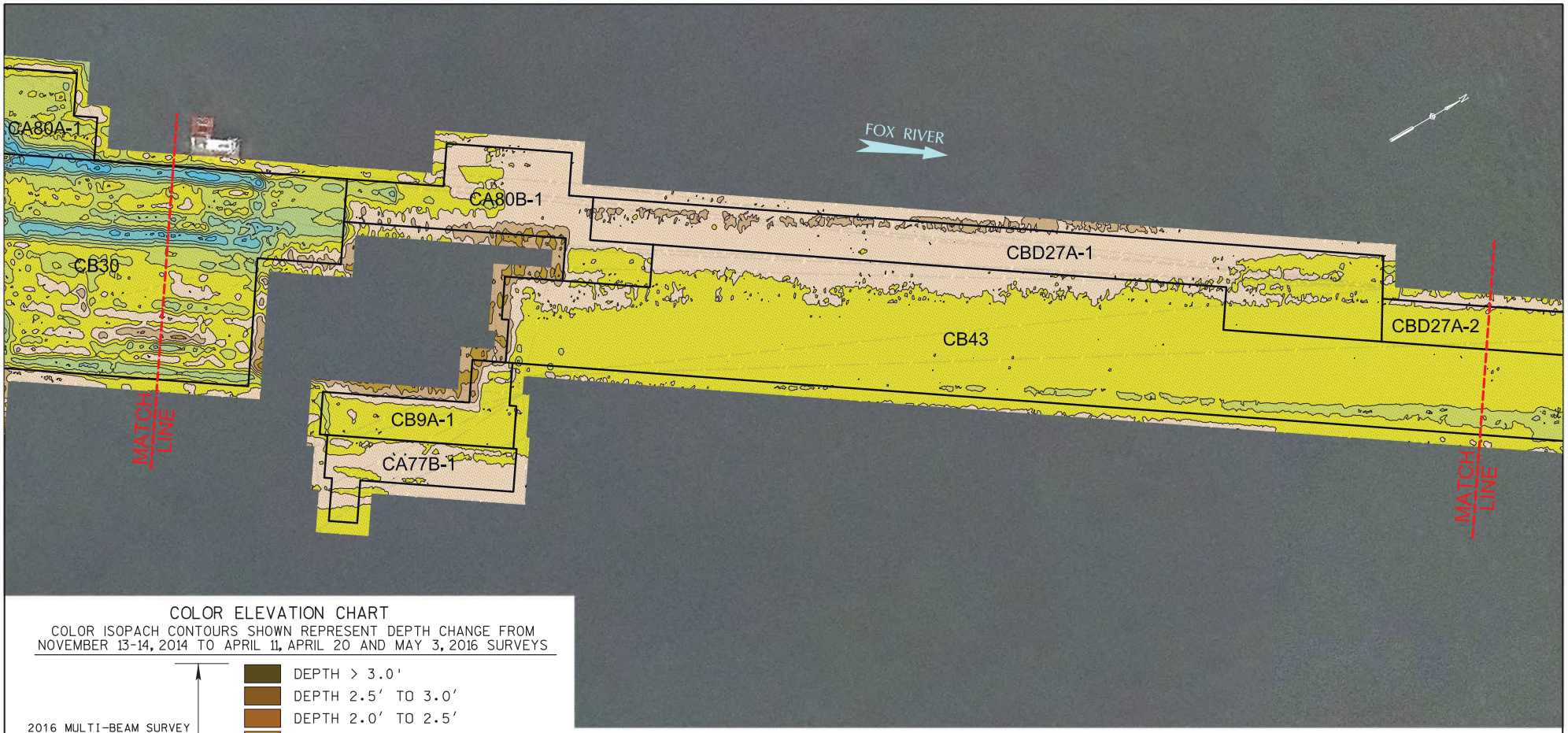

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO APRIL 11, APRIL 20 AND MAY 3, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 7C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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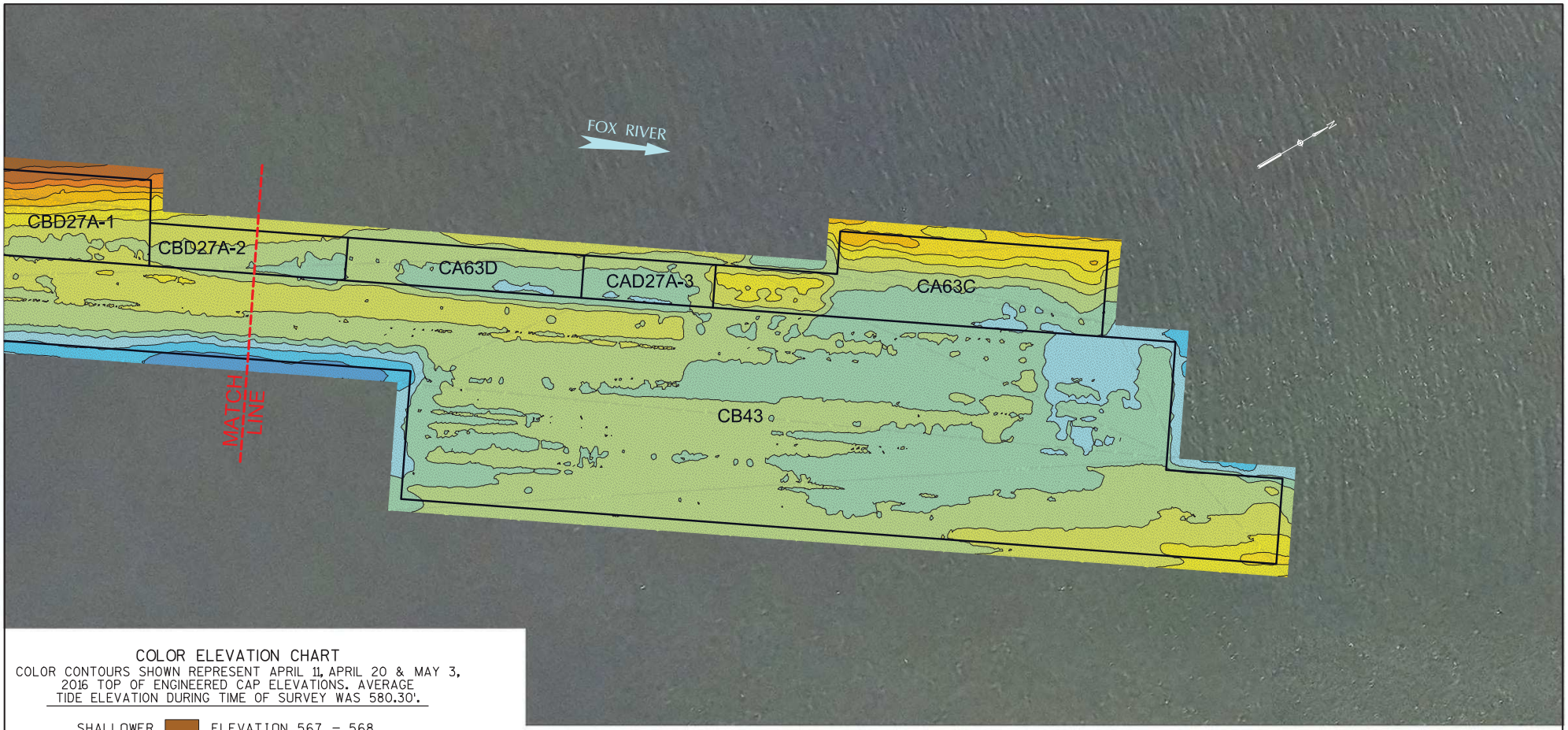

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT APRIL 11, APRIL 20 & MAY 3, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS 580.30'.

SHALLOWER	ELEVATION 567 – 568
	ELEVATION 566 – 567
	ELEVATION 565 – 566
	ELEVATION 564 – 565
	ELEVATION 563 – 564
WATER DEPTH	ELEVATION 562 – 563
	ELEVATION 561 – 562
	ELEVATION 560 – 561
	ELEVATION 559 – 560
	ELEVATION 558 – 559
	ELEVATION 557 – 558
	ELEVATION 556 – 557
DEEPER	ELEVATION 555 – 556

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 8A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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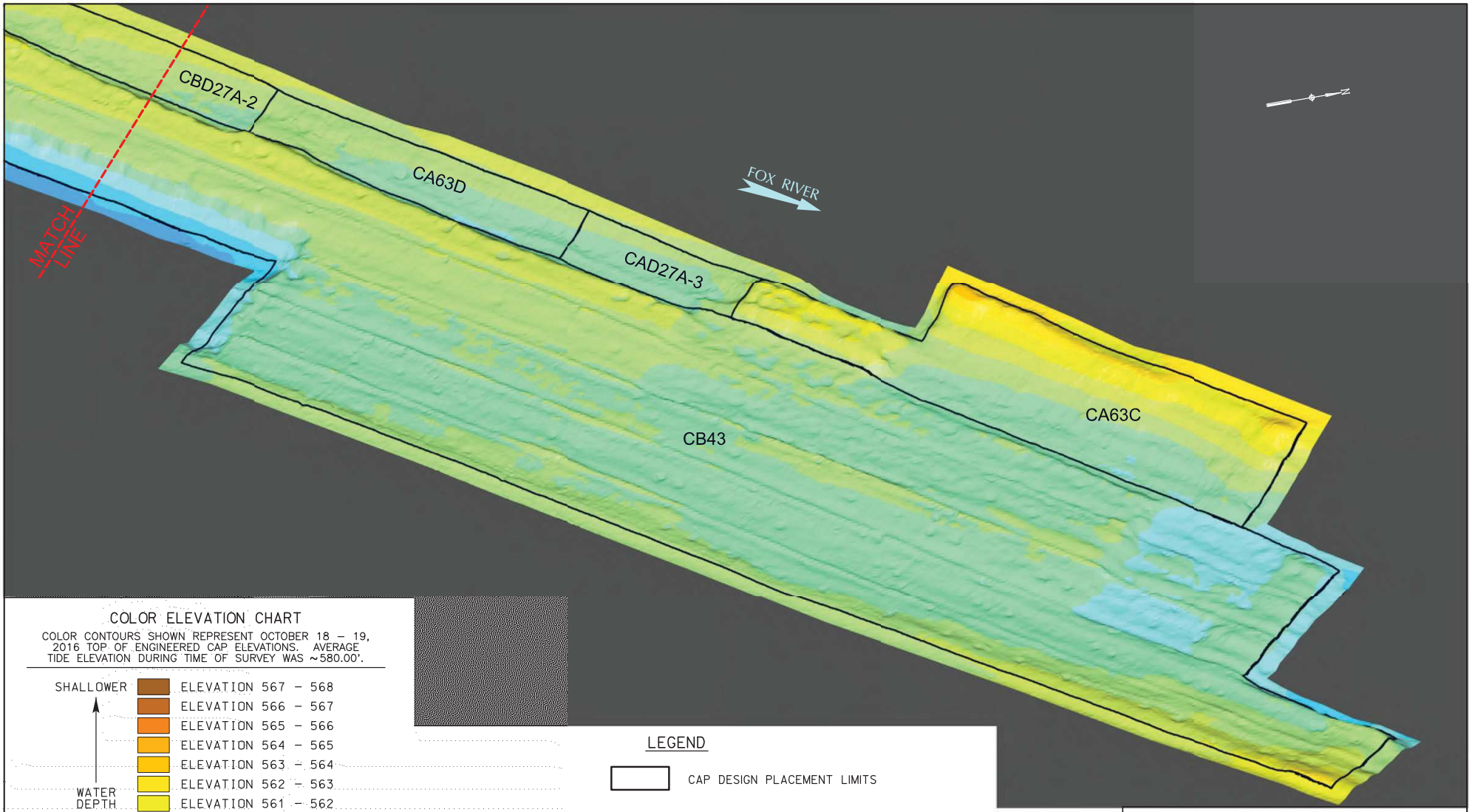

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 – 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER		ELEVATION 567 – 568
		ELEVATION 566 – 567
		ELEVATION 565 – 566
		ELEVATION 564 – 565
		ELEVATION 563 – 564
		ELEVATION 562 – 563
WATER DEPTH		ELEVATION 561 – 562
		ELEVATION 560 – 561
		ELEVATION 559 – 560
		ELEVATION 558 – 559
		ELEVATION 557 – 558
		ELEVATION 556 – 557
DEEPER		ELEVATION 555 – 556

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 8B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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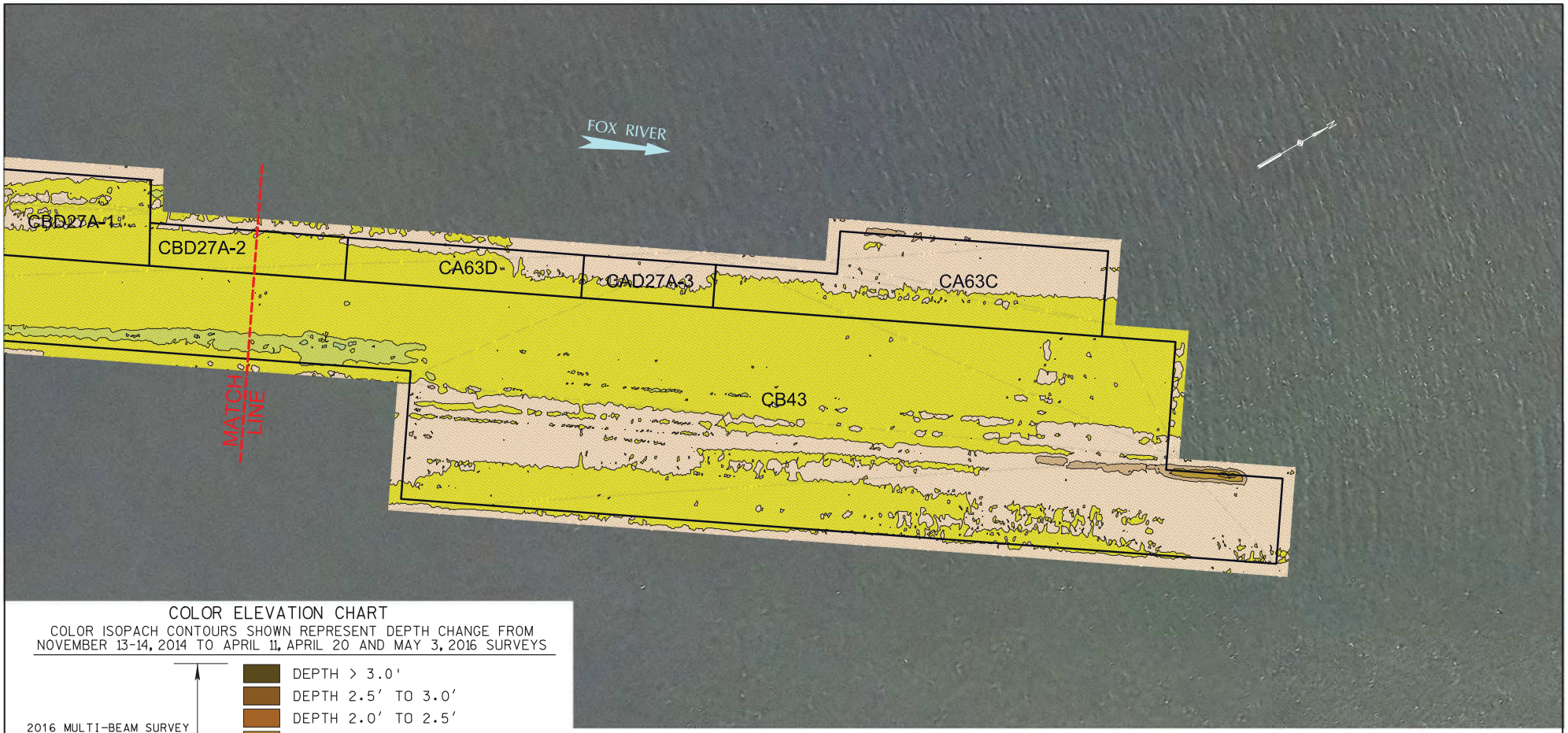

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO APRIL 11, APRIL 20 AND MAY 3, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 8C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: JULY, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 25, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

COLOR ELEVATION CHART

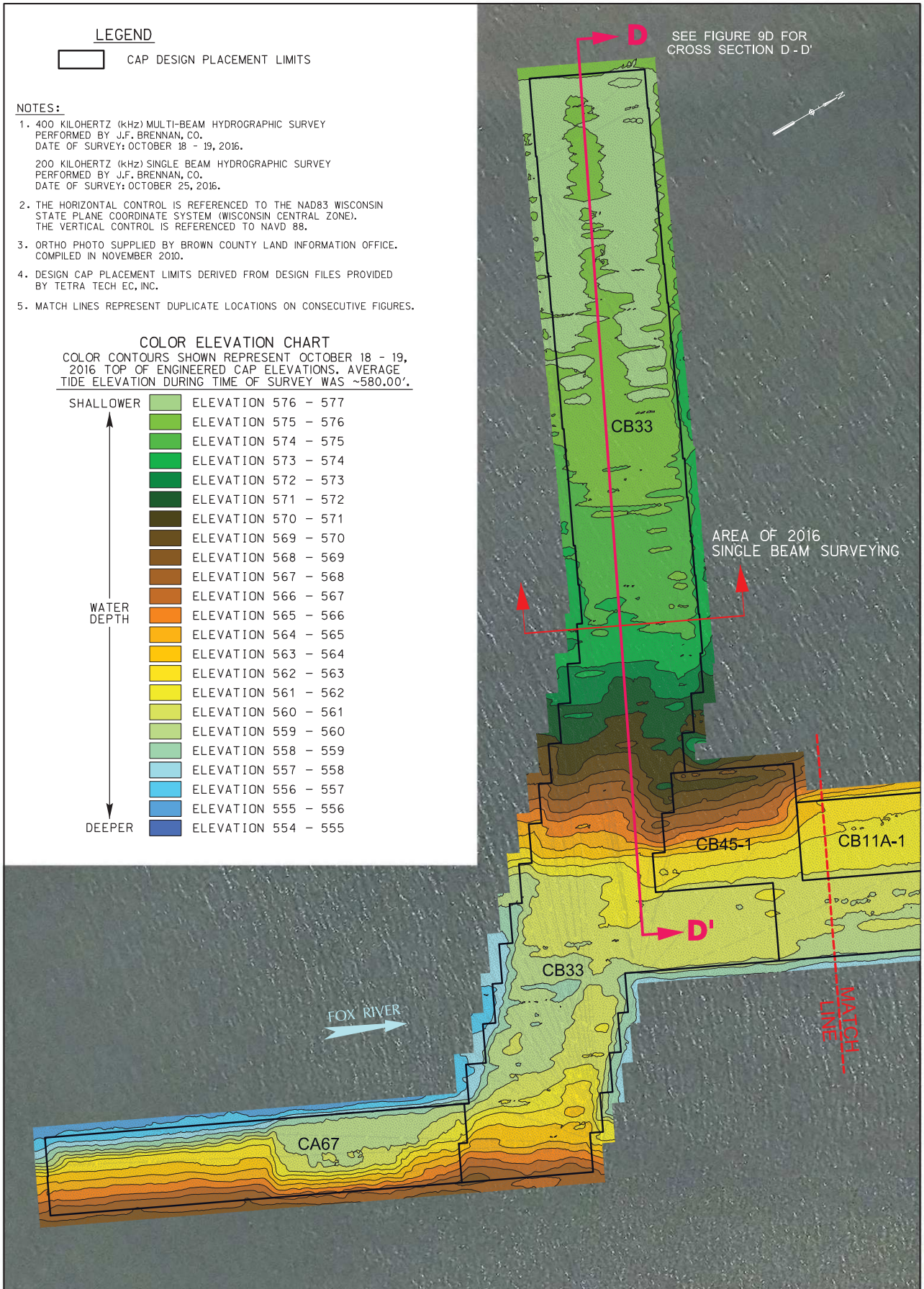
COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

ELEVATION 576 - 577
ELEVATION 575 - 576
ELEVATION 574 - 575
ELEVATION 573 - 574
ELEVATION 572 - 573
ELEVATION 571 - 572
ELEVATION 570 - 571
ELEVATION 569 - 570
ELEVATION 568 - 569
ELEVATION 567 - 568
ELEVATION 566 - 567
ELEVATION 565 - 566
ELEVATION 564 - 565
ELEVATION 563 - 564
ELEVATION 562 - 563
ELEVATION 561 - 562
ELEVATION 560 - 561
ELEVATION 559 - 560
ELEVATION 558 - 559
ELEVATION 557 - 558
ELEVATION 556 - 557
ELEVATION 555 - 556
ELEVATION 554 - 555

WATER DEPTH

DEEPER



LOWER FOX RIVER REMEDIATION LLC.

FIGURE 9A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Foth

0 40' 80'
BAR SCALE

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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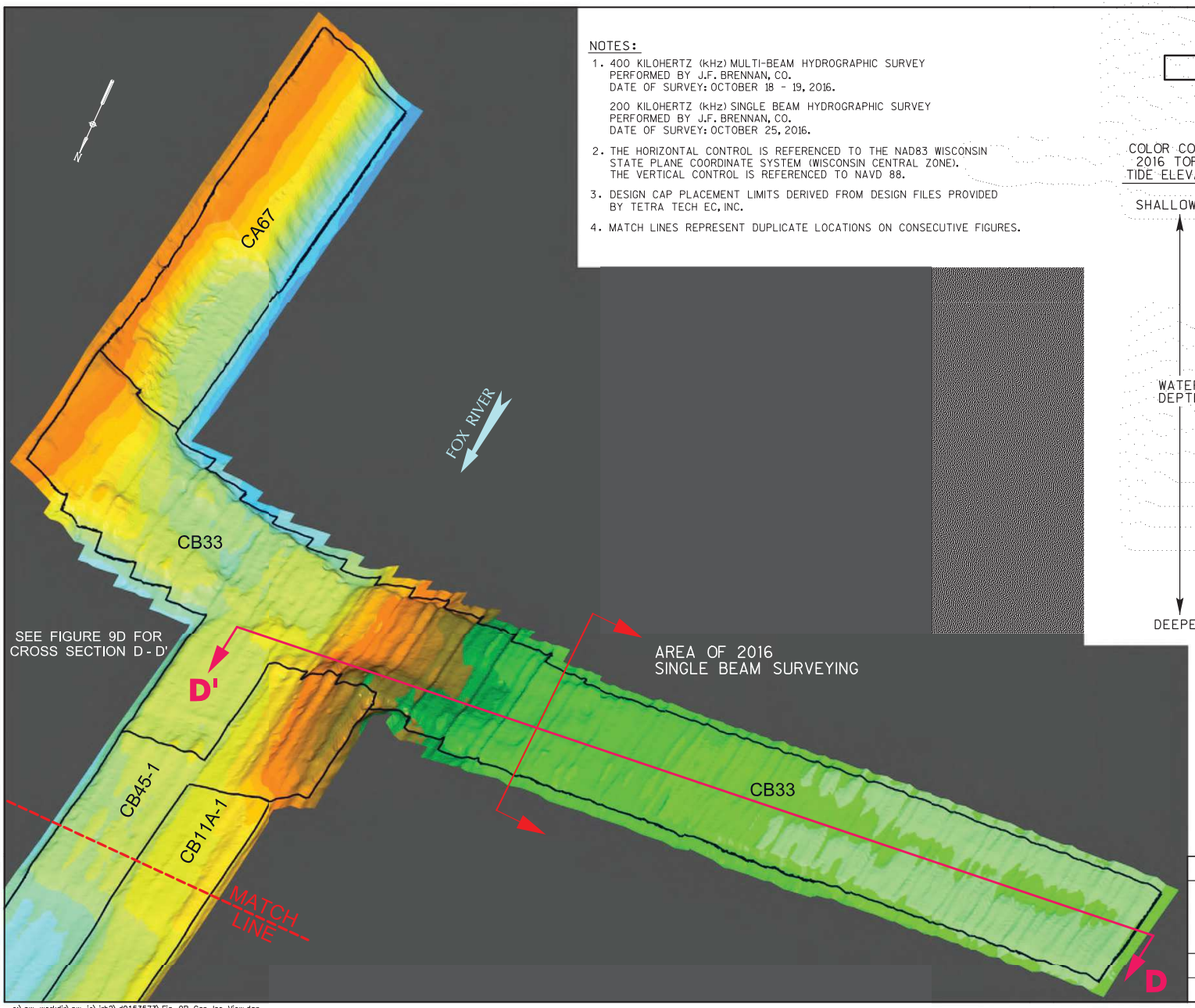

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 25, 2016.

2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.

3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

ELEVATION 574 - 575
ELEVATION 573 - 574
ELEVATION 572 - 573
ELEVATION 571 - 572
ELEVATION 570 - 571
ELEVATION 569 - 570
ELEVATION 568 - 569
ELEVATION 567 - 568
ELEVATION 566 - 567
ELEVATION 565 - 566
ELEVATION 564 - 565
ELEVATION 563 - 564
ELEVATION 562 - 563
ELEVATION 561 - 562
ELEVATION 560 - 561
ELEVATION 559 - 560
ELEVATION 558 - 559
ELEVATION 557 - 558
ELEVATION 556 - 557
ELEVATION 555 - 556
ELEVATION 554 - 555

WATER DEPTH

DEEPER

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 9B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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LEGEND

CAP DESIGN PLACEMENT LIMITS

170' GRID LINES USED FOR POLING LOCATIONS

P100 0.2' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.

   200 KILOHERTZ (kHz) SINGLE BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 25, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.
5. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
6. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

COLOR ELEVATION CHART

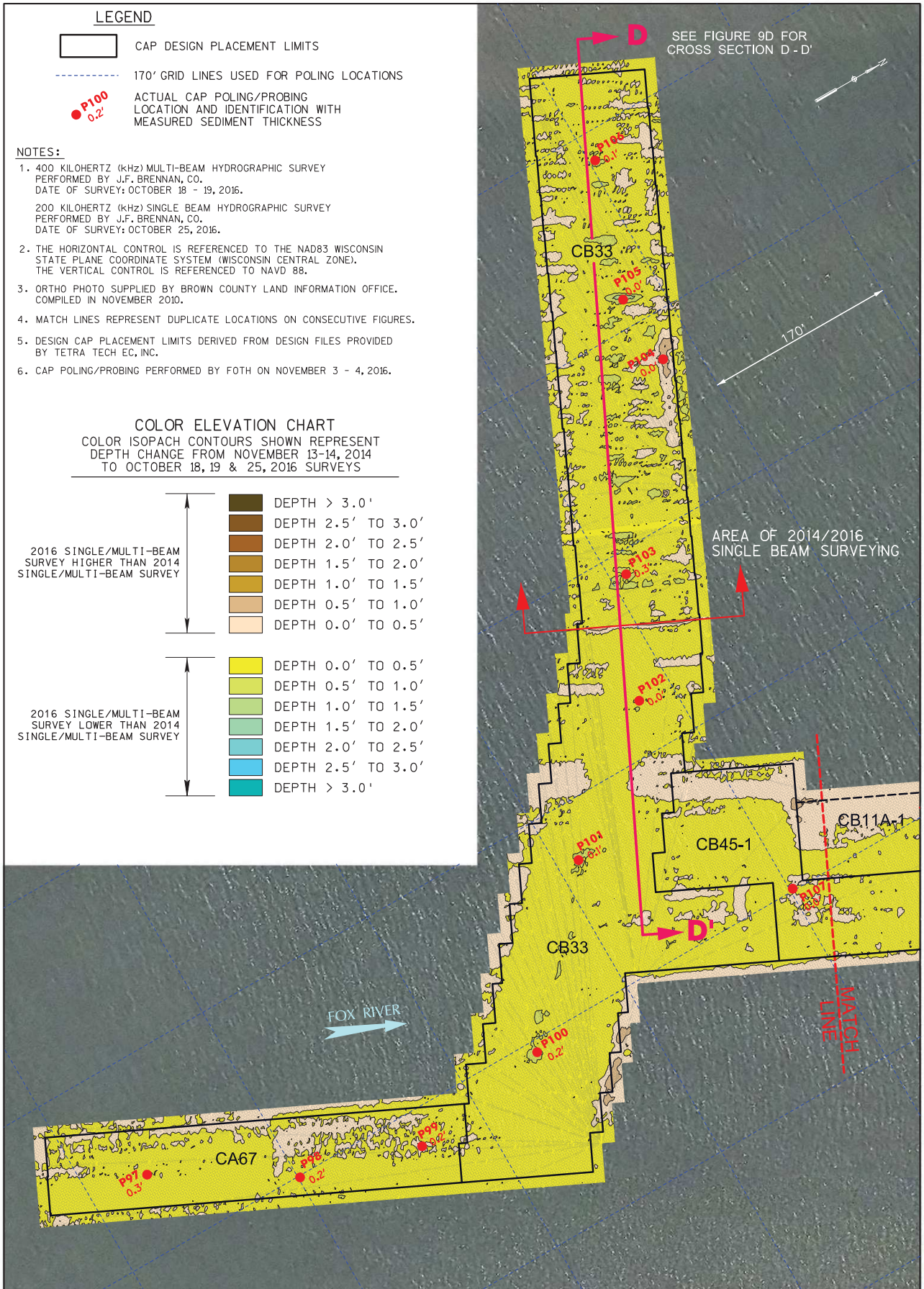
COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18, 19 & 25, 2016 SURVEYS

2016 SINGLE/MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 SINGLE/MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'



LOWER FOX RIVER REMEDIATION LLC.

Foth

FIGURE 9C

LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

0 40' 80'
BAR SCALE

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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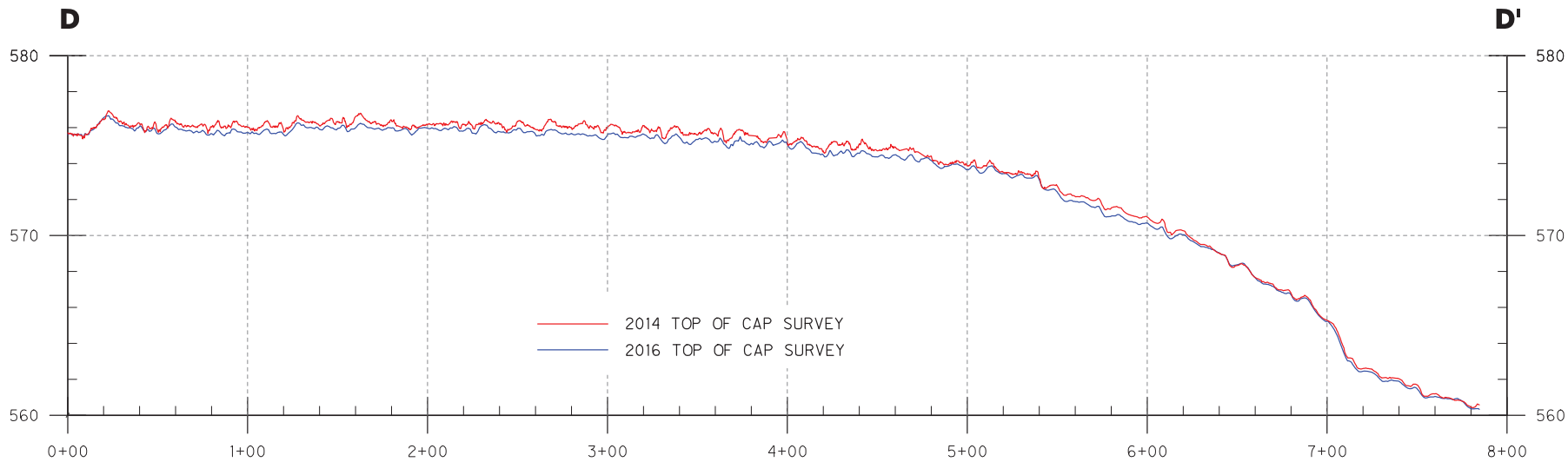

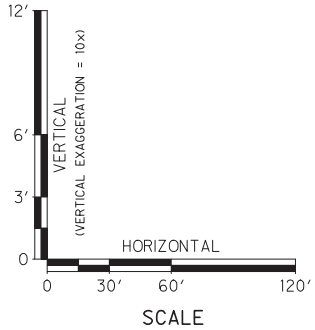

SEE FIGURES 9A, 9B & 9C FOR
CROSS SECTION LOCATION

Foth

SCALE: AS SHOWN

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 9D

LOWER FOX RIVER - OU4
TOP OF CAP CROSS SECTION

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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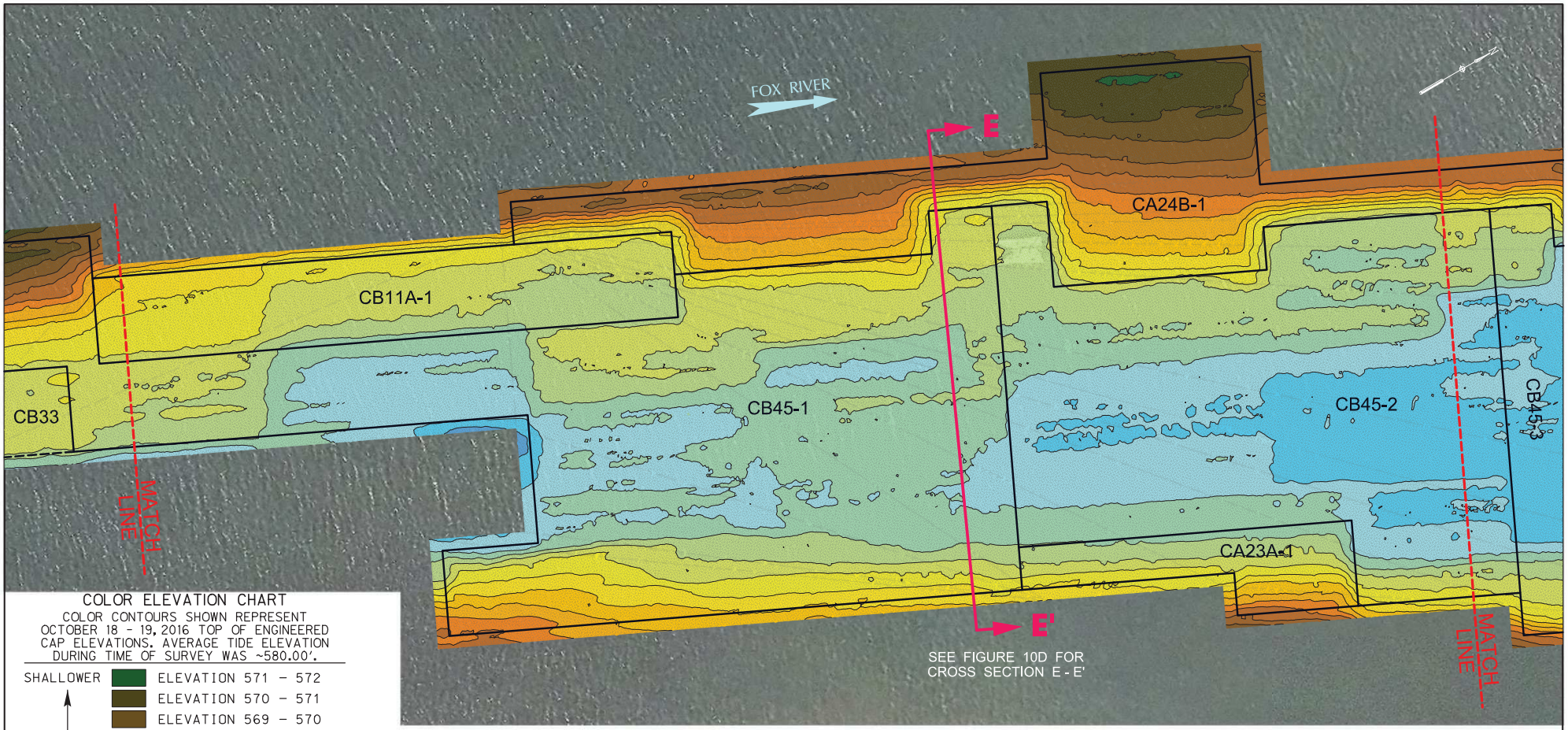

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER	ELEVATION 571 - 572
	ELEVATION 570 - 571
	ELEVATION 569 - 570
	ELEVATION 568 - 569
	ELEVATION 567 - 568
	ELEVATION 566 - 567
	ELEVATION 565 - 566
WATER DEPTH	ELEVATION 564 - 565
	ELEVATION 563 - 564
	ELEVATION 562 - 563
	ELEVATION 561 - 562
	ELEVATION 560 - 561
	ELEVATION 559 - 560
	ELEVATION 558 - 559
	ELEVATION 557 - 558
DEEPER	ELEVATION 556 - 557

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 10A

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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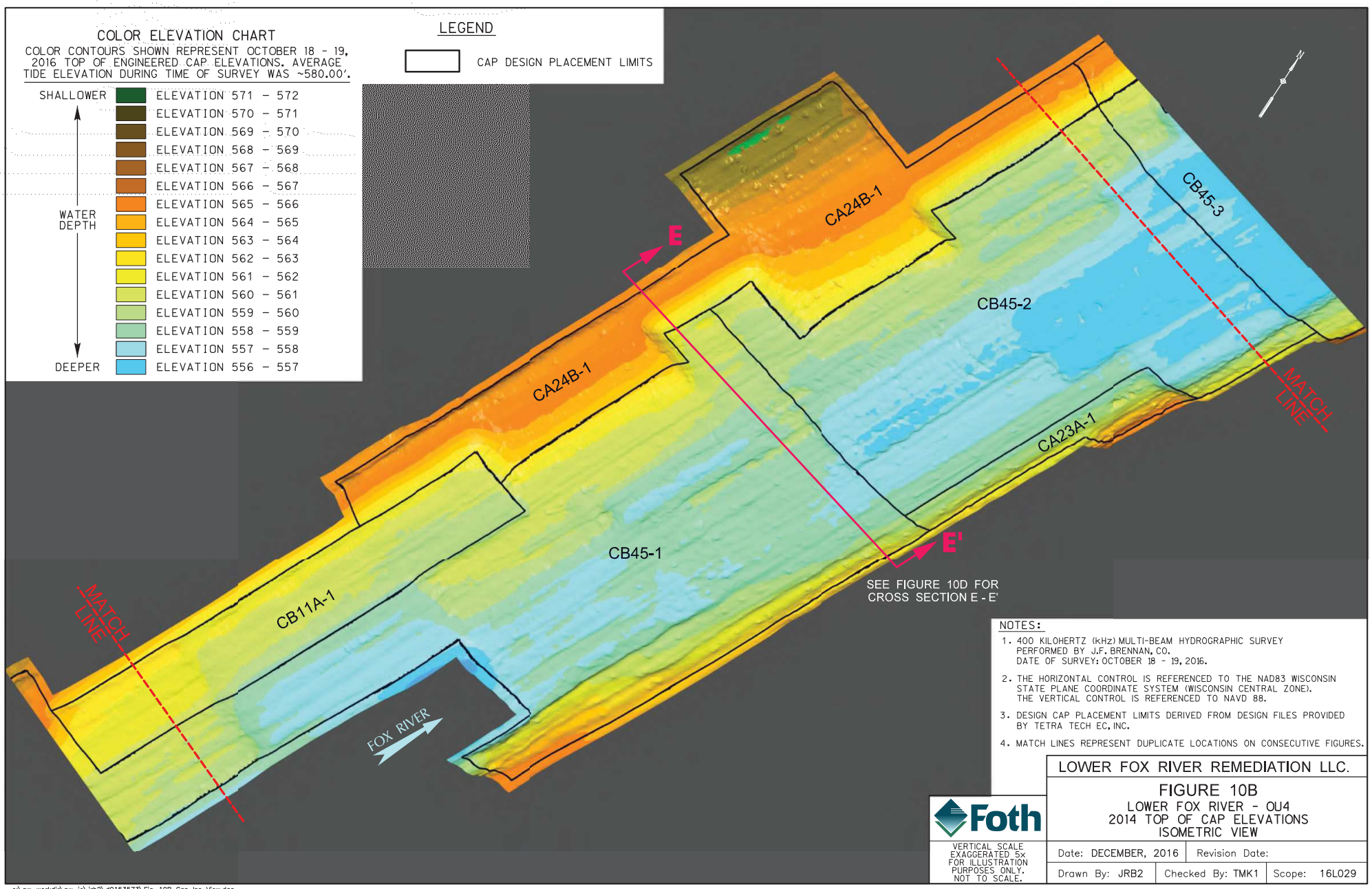

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 10B
LOWER FOX RIVER - OU4
2014 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18 - 19, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.
6. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P110 0.3' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 10C

LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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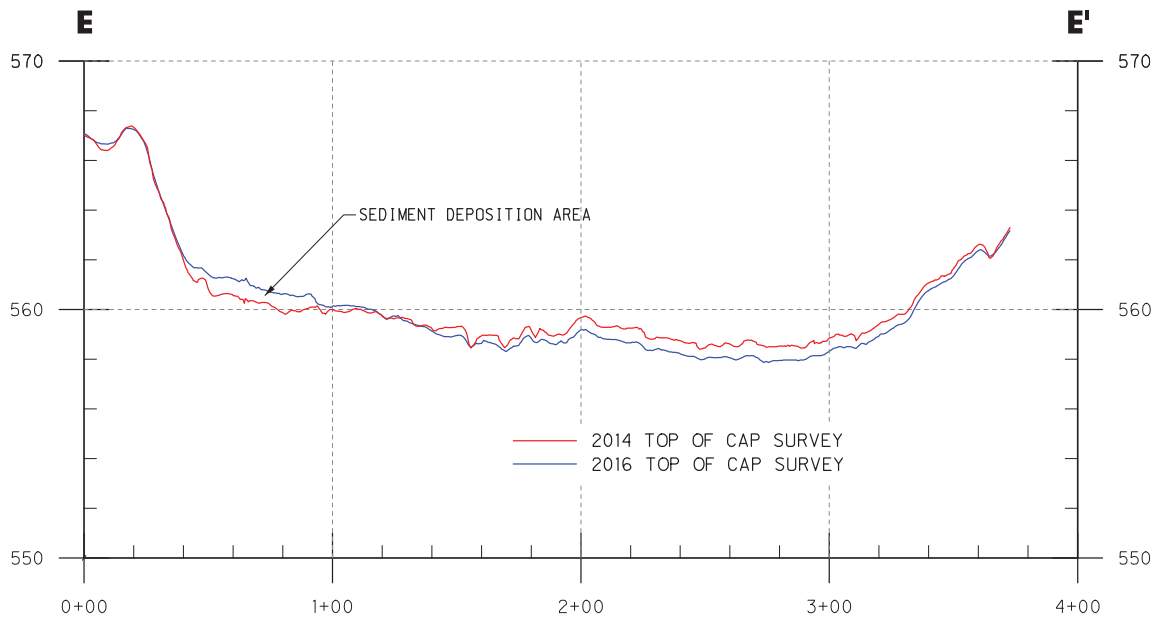

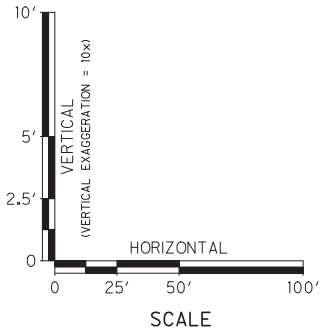

SEE FIGURES 10A, 10B & 10C FOR
CROSS SECTION LOCATION E – E'

Foth

SCALE: AS SHOWN

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 10D

LOWER FOX RIVER – OU4
TOP OF CAP CROSS SECTION

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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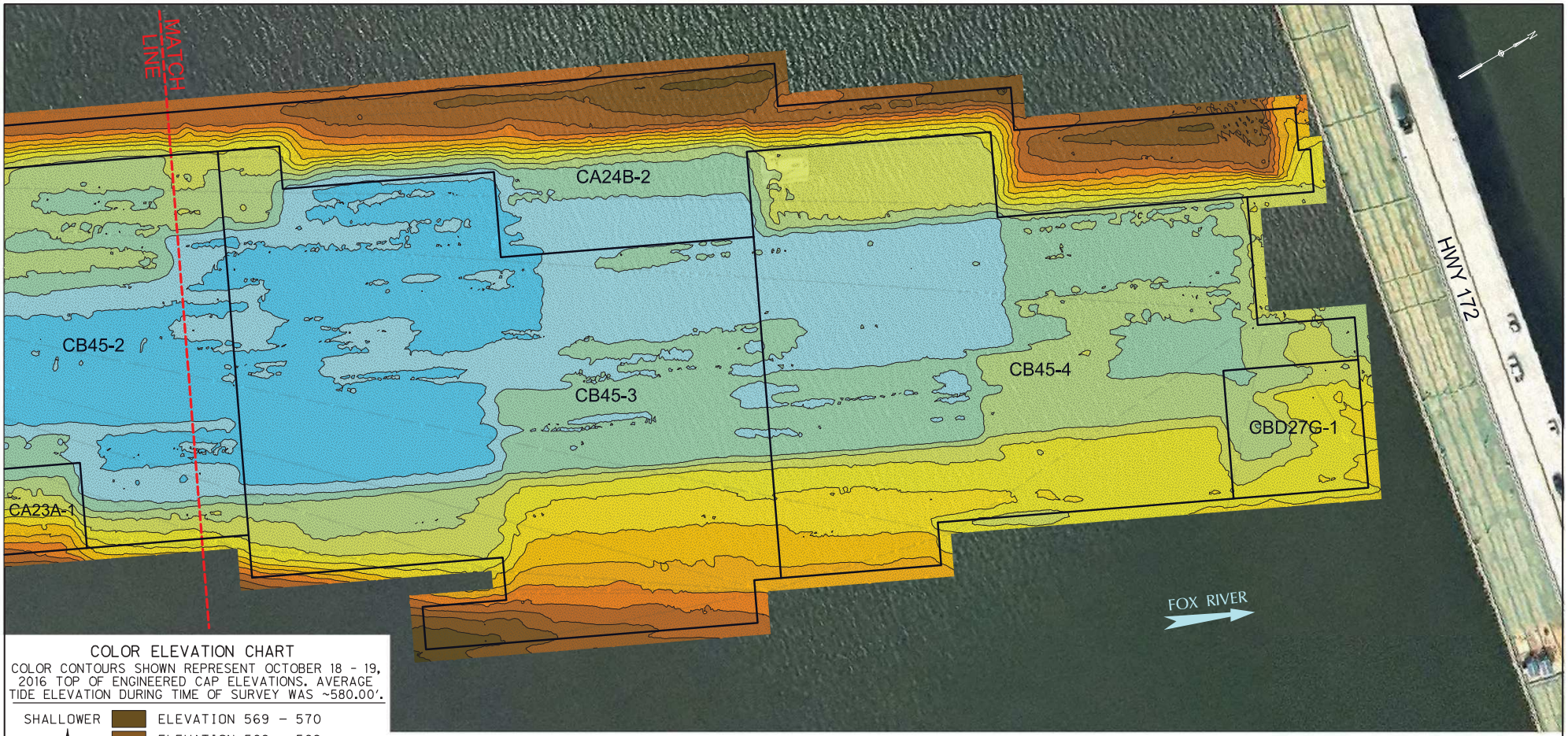

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

- ELEVATION 569 - 570
- ELEVATION 568 - 569
- ELEVATION 567 - 568
- ELEVATION 566 - 567
- ELEVATION 565 - 566
- ELEVATION 564 - 565
- ELEVATION 563 - 564
- ELEVATION 562 - 563
- ELEVATION 561 - 562
- ELEVATION 560 - 561
- ELEVATION 559 - 560
- ELEVATION 558 - 559
- ELEVATION 557 - 558
- ELEVATION 556 - 557

WATER DEPTH

DEEPER

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 11A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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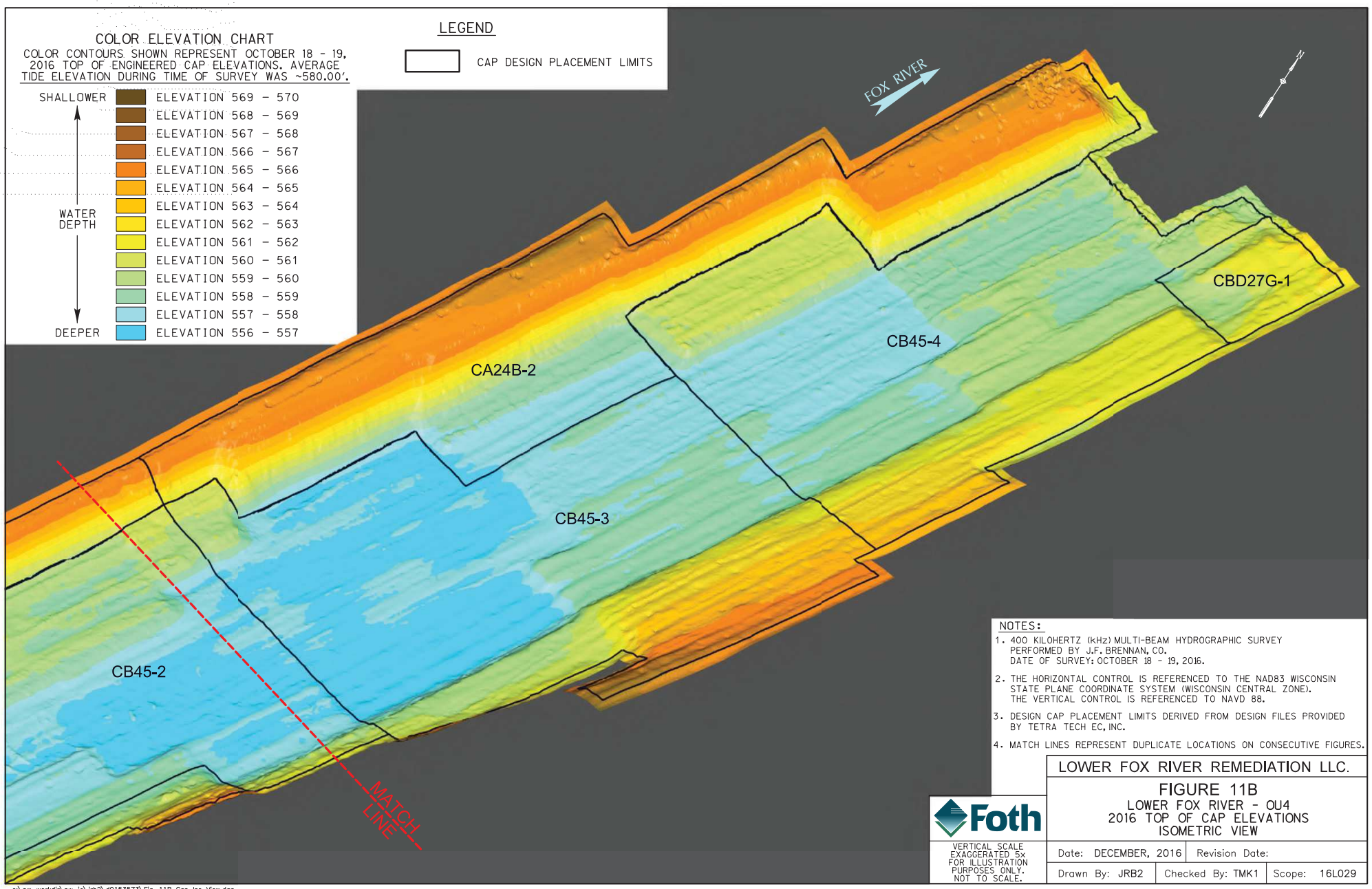

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
4. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 11B
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18 - 19, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P137 0.3' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 11C

LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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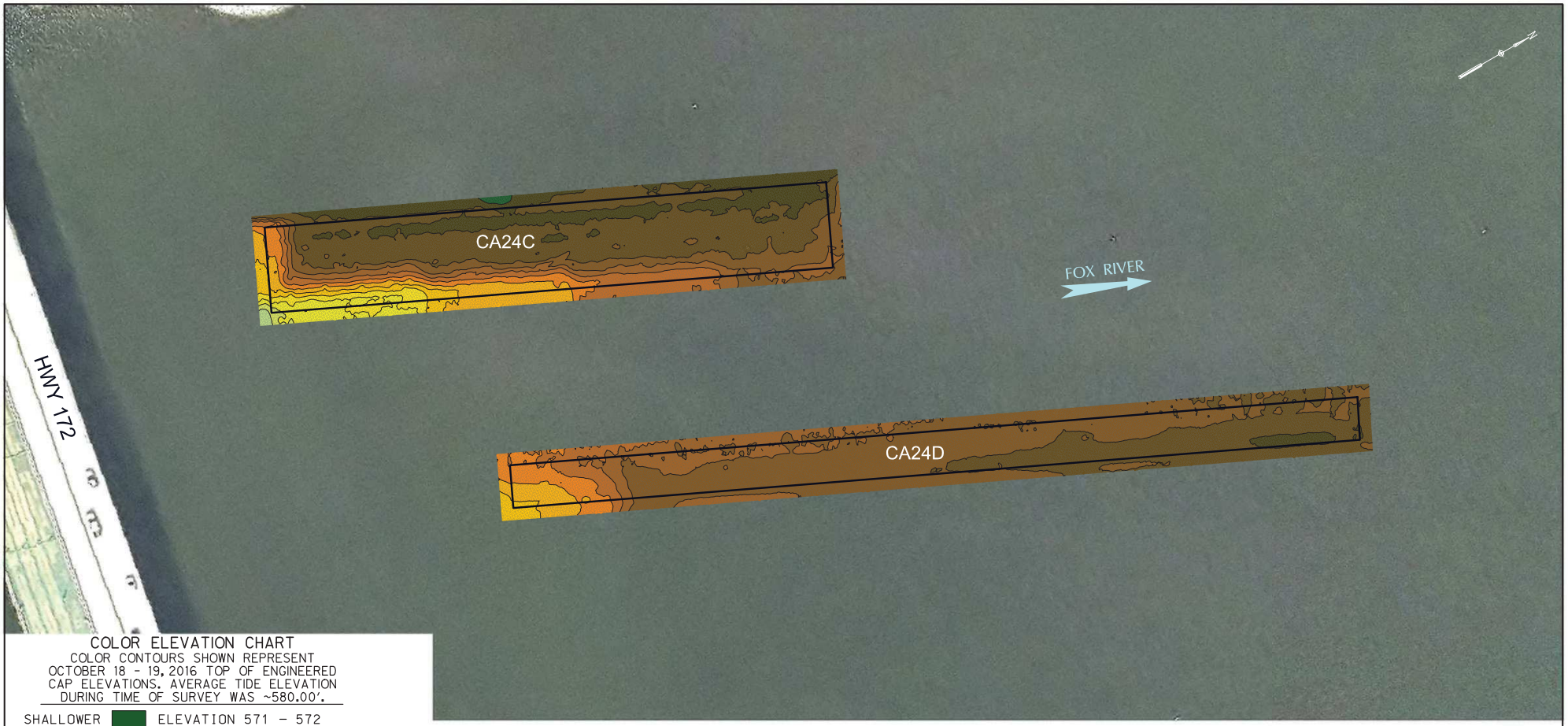

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER	ELEVATION 571 - 572
	ELEVATION 570 - 571
	ELEVATION 569 - 570
	ELEVATION 568 - 569
	ELEVATION 567 - 568
	ELEVATION 566 - 567
	ELEVATION 565 - 566
WATER DEPTH	ELEVATION 564 - 565
	ELEVATION 563 - 564
	ELEVATION 562 - 563
	ELEVATION 561 - 562
	ELEVATION 560 - 561
	ELEVATION 559 - 560
DEEPER	ELEVATION 558 - 559

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 12A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: NOVEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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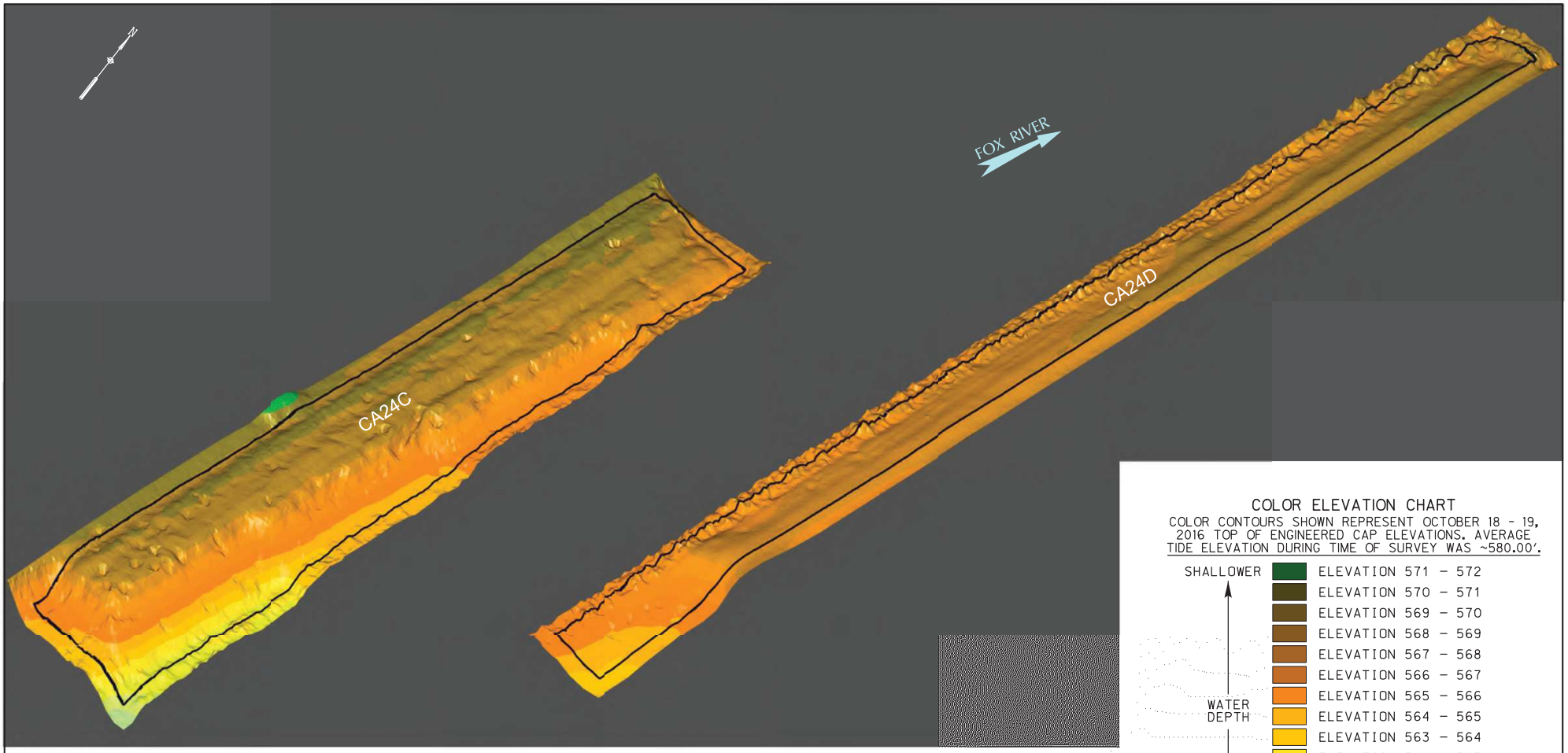

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER

ELEVATION 571 - 572
ELEVATION 570 - 571
ELEVATION 569 - 570
ELEVATION 568 - 569
ELEVATION 567 - 568
ELEVATION 566 - 567
ELEVATION 565 - 566
ELEVATION 564 - 565
ELEVATION 563 - 564
ELEVATION 562 - 563
ELEVATION 561 - 562
ELEVATION 560 - 561
ELEVATION 559 - 560
ELEVATION 558 - 559

WATER DEPTH

DEEPER

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 12B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18 - 19, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.
6. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P147 0.2' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 12C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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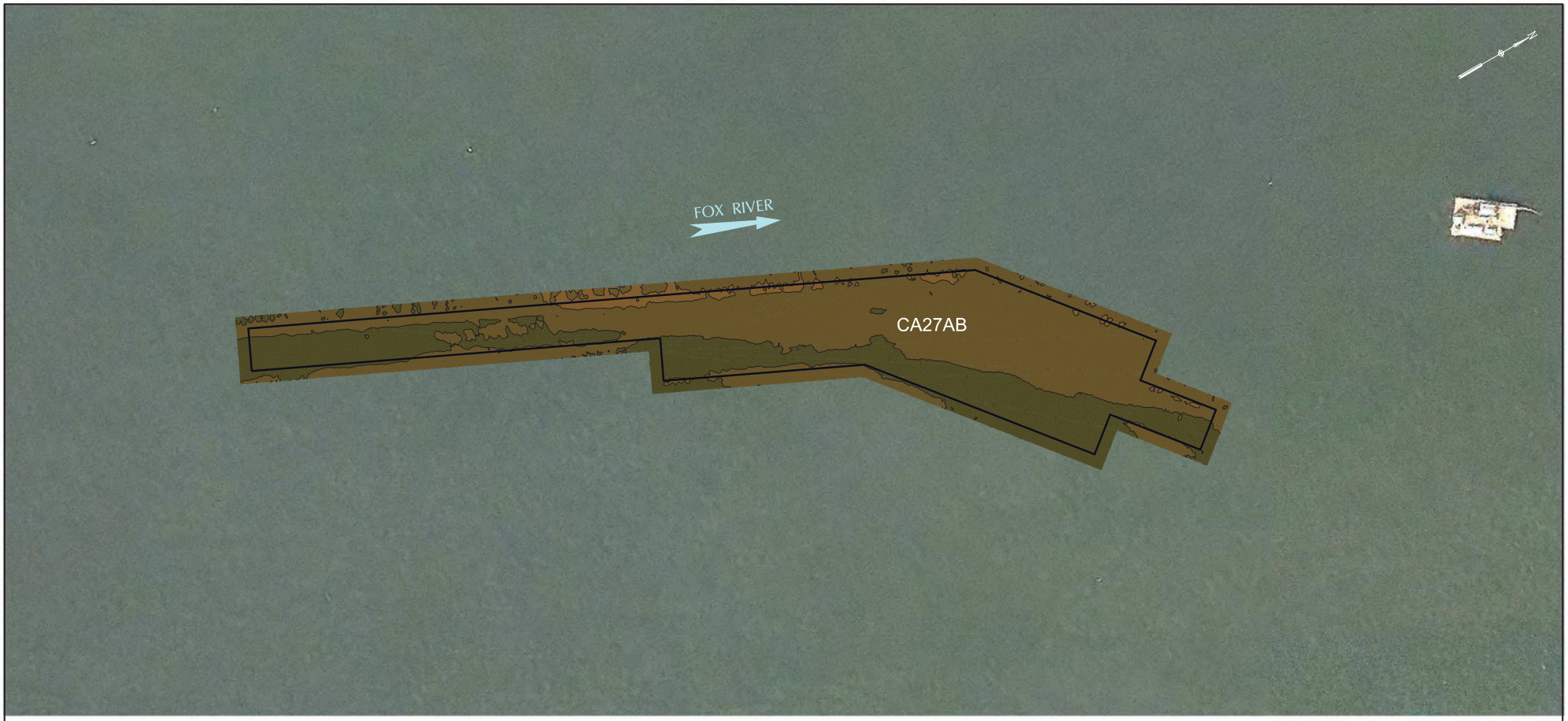

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER		ELEVATION 571 - 572
↑		ELEVATION 570 - 571
WATER DEPTH		ELEVATION 569 - 570
		ELEVATION 568 - 569
↓		ELEVATION 567 - 568
DEEPER		ELEVATION 566 - 567

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 13A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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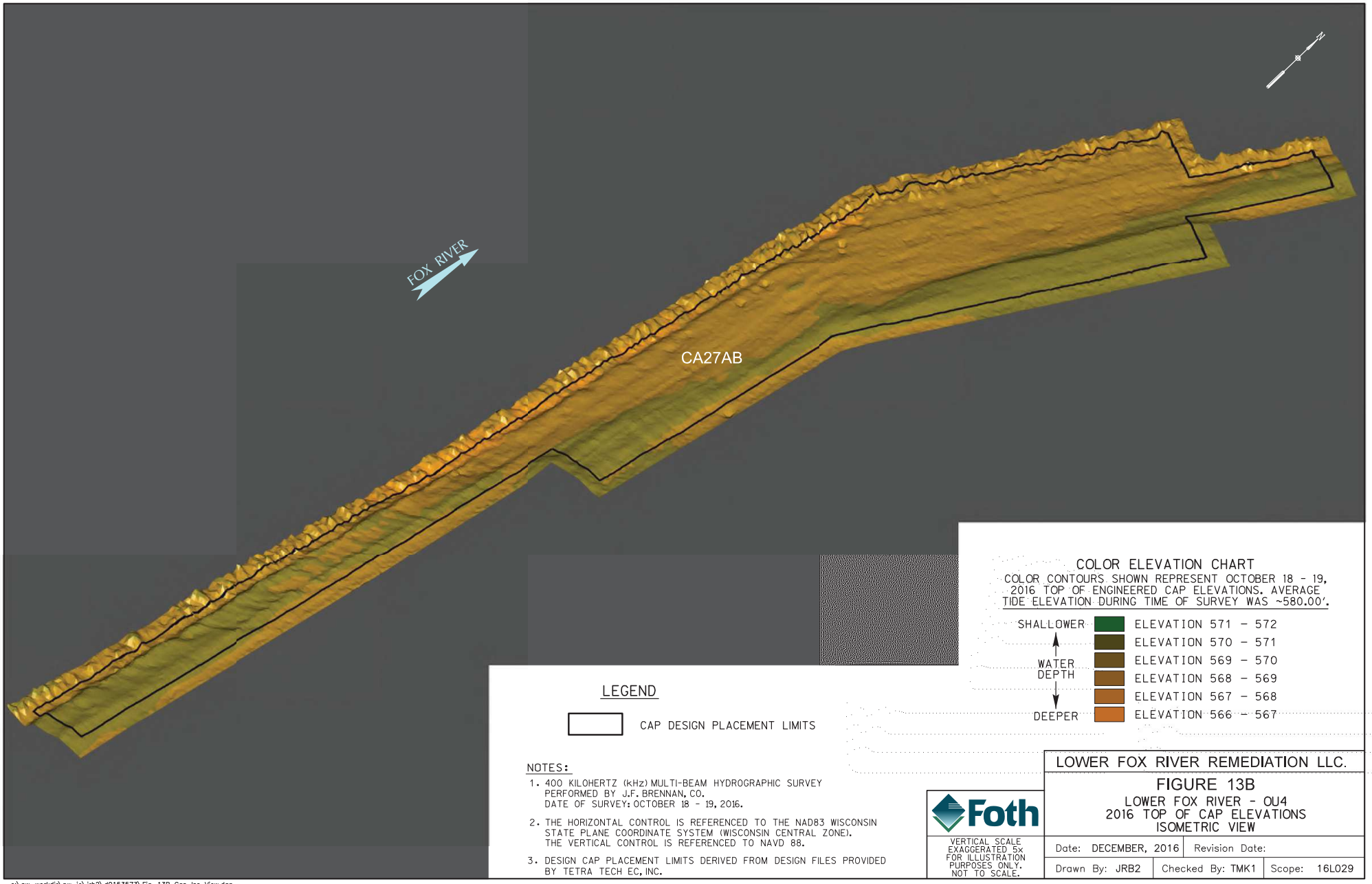

COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT OCTOBER 18 - 19, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER		ELEVATION 571 - 572
↑		ELEVATION 570 - 571
WATER DEPTH		ELEVATION 569 - 570
		ELEVATION 568 - 569
↓		ELEVATION 567 - 568
DEEPER		ELEVATION 566 - 567

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 13B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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1/31/2018 3:35:54 PM JRB2

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO OCTOBER 18 -19, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: OCTOBER 18 - 19, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P151 0.2' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 13C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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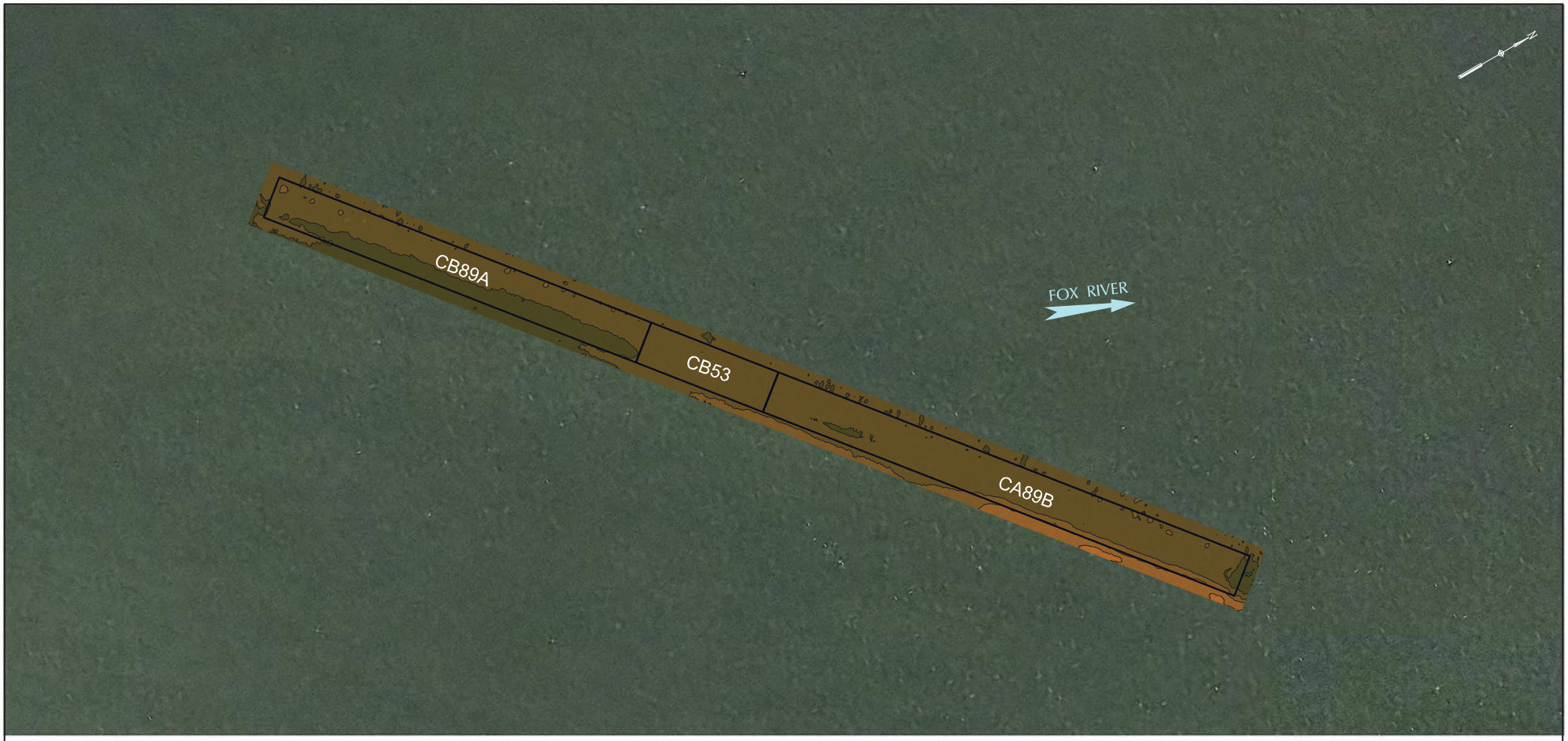
2/1/2018 11:48:13 AM JRB2



COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT DECEMBER 1, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER		ELEVATION 571 - 572
↑		ELEVATION 570 - 571
WATER DEPTH		ELEVATION 569 - 570
		ELEVATION 568 - 569
↓		ELEVATION 567 - 568
DEEPER		ELEVATION 566 - 567

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: APRIL 11, APRIL 20 AND MAY 3, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. MATCH LINES REPRESENT DUPLICATE LOCATIONS ON CONSECUTIVE FIGURES.

LEGEND

CAP DESIGN PLACEMENT LIMITS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 14A
LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
PLAN VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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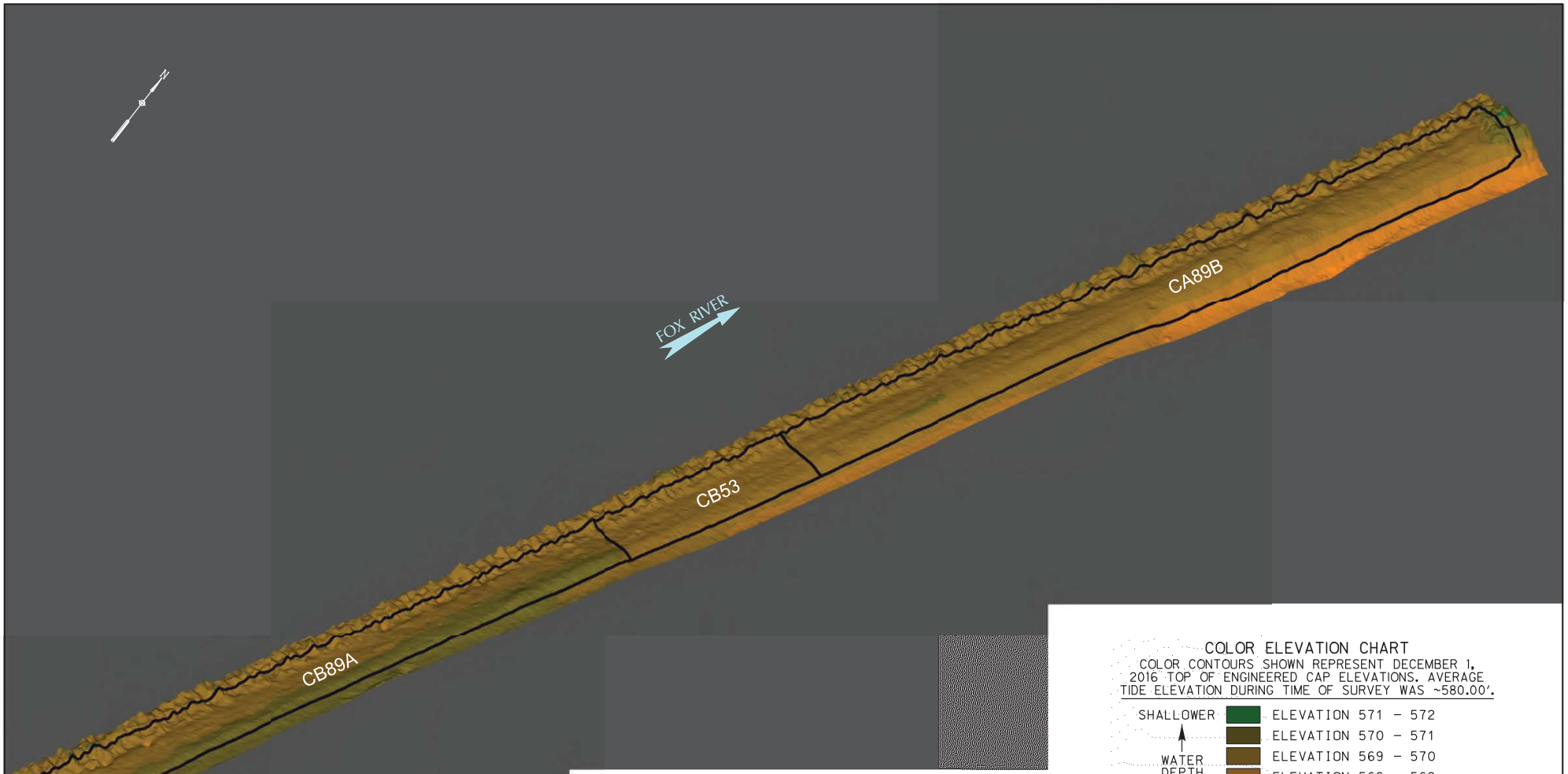
4/12/2018 11:05:49 AM JRB2



COLOR ELEVATION CHART

COLOR CONTOURS SHOWN REPRESENT DECEMBER 1, 2016 TOP OF ENGINEERED CAP ELEVATIONS. AVERAGE TIDE ELEVATION DURING TIME OF SURVEY WAS ~580.00'.

SHALLOWER		ELEVATION 571 – 572
↑		ELEVATION 570 – 571
WATER DEPTH		ELEVATION 569 – 570
		ELEVATION 568 – 569
↓		ELEVATION 567 – 568
DEEPER		ELEVATION 566 – 567

LEGEND

CAP DESIGN PLACEMENT LIMITS

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: DECEMBER 1, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.

Foth

VERTICAL SCALE EXAGGERATED 5x FOR ILLUSTRATION PURPOSES ONLY. NOT TO SCALE.

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 14B

LOWER FOX RIVER - OU4
2016 TOP OF CAP ELEVATIONS
ISOMETRIC VIEW

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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4/12/2018 11:11:03 AM JRB2

COLOR ELEVATION CHART

COLOR ISOPACH CONTOURS SHOWN REPRESENT DEPTH CHANGE FROM NOVEMBER 13-14, 2014 TO DECEMBER 1, 2016 SURVEYS

2016 MULTI-BEAM SURVEY HIGHER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH > 3.0'
- DEPTH 2.5' TO 3.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 0.0' TO 0.5'

2016 MULTI-BEAM SURVEY LOWER THAN 2014 SINGLE/MULTI-BEAM SURVEY

- DEPTH 0.0' TO 0.5'
- DEPTH 0.5' TO 1.0'
- DEPTH 1.0' TO 1.5'
- DEPTH 1.5' TO 2.0'
- DEPTH 2.0' TO 2.5'
- DEPTH 2.5' TO 3.0'
- DEPTH > 3.0'

NOTES:

1. 400 KILOHERTZ (kHz) MULTI-BEAM HYDROGRAPHIC SURVEY PERFORMED BY J.F. BRENNAN, CO. DATE OF SURVEY: DECEMBER 1, 2016.
2. THE HORIZONTAL CONTROL IS REFERENCED TO THE NAD83 WISCONSIN STATE PLANE COORDINATE SYSTEM (WISCONSIN CENTRAL ZONE). THE VERTICAL CONTROL IS REFERENCED TO NAVD 88.
3. ORTHO PHOTO SUPPLIED BY BROWN COUNTY LAND INFORMATION OFFICE. COMPILED IN NOVEMBER 2010.
4. DESIGN CAP PLACEMENT LIMITS DERIVED FROM DESIGN FILES PROVIDED BY TETRA TECH EC, INC.
5. CAP POLING/PROBING PERFORMED BY FOTH ON NOVEMBER 3 - 4, 2016.

LEGEND

- CAP DESIGN PLACEMENT LIMITS
- 170' GRID LINES USED FOR POLING LOCATIONS
- P156 0.4' — ACTUAL CAP POLING/PROBING LOCATION AND IDENTIFICATION WITH MEASURED SEDIMENT THICKNESS

Foth

0 40' 80'
BAR SCALE

LOWER FOX RIVER REMEDIATION LLC.

FIGURE 14C
LOWER FOX RIVER - OU4
ISOPACH MAP BETWEEN THE 2014 & 2016 POST-CAPPING SURVEYS

Date: DECEMBER, 2016	Revision Date:	
Drawn By: JRB2	Checked By: TMK1	Scope: 16L029

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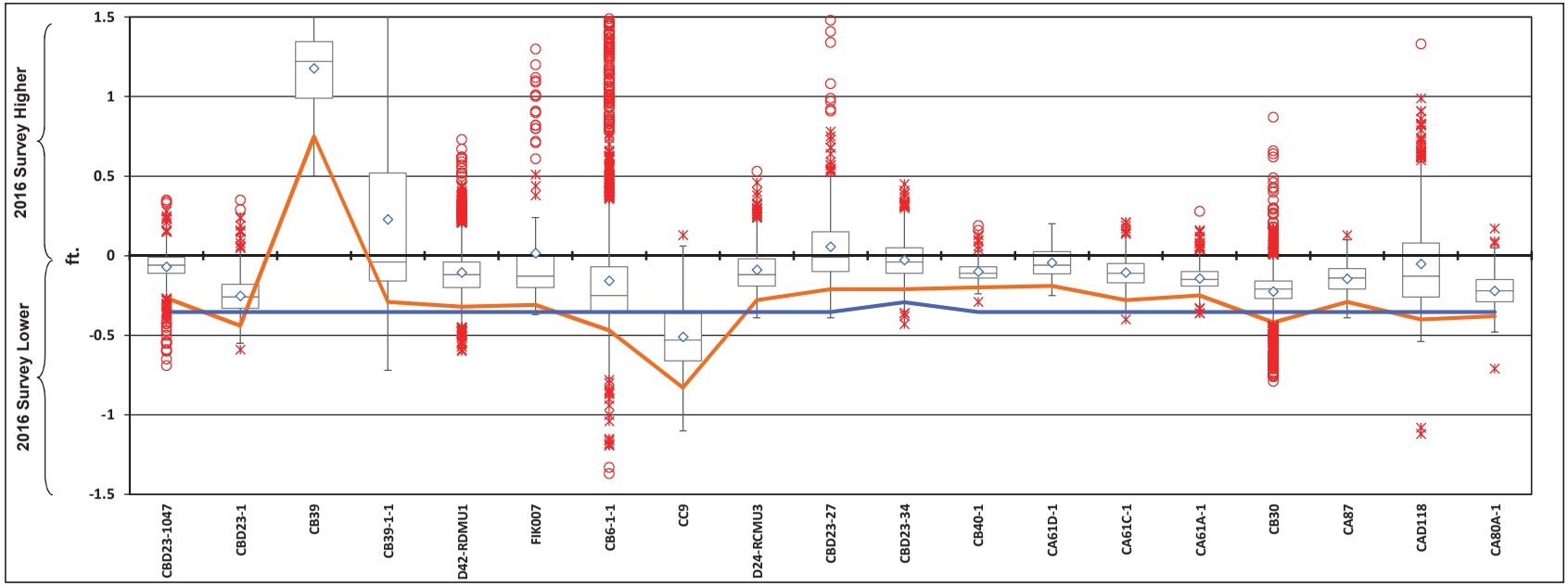
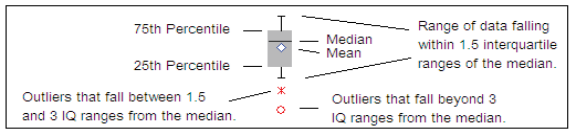
Boxplot Distributions of Survey Differences for 2016 Minus 2014 (400 kHz Multi-Beam[1])



n[2]:	826	850	1460	8387	3604	141	7416	838	681	804	1228	250	136	207	576	10244	394	715	264
5th Percentile:	-0.27	-0.44	0.75	-0.29	-0.32	-0.31	-0.47	-0.83	-0.28	-0.21	-0.21	-0.20	-0.19	-0.28	-0.25	-0.42	-0.29	-0.40	-0.38
50th Percentile:	-0.06	-0.26	1.22	-0.04	-0.12	-0.13	-0.25	-0.53	-0.12	-0.01	-0.04	-0.11	-0.06	-0.11	-0.15	-0.21	-0.14	-0.13	-0.22
95th Percentile:	0.07	-0.05	1.51	1.36	0.24	1.01	0.27	-0.13	0.21	0.46	0.20	0.01	0.13	0.12	-0.02	-0.07	0.01	0.59	-0.07
Vertical Error[3]:	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.29	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35

Boxplot Legend:



Notes: [1]Localized portions of CBD23-DMU27, CAD118 and CB33 had less than 3 feet of water in 2014, and a single beam echo sounder was used in place of the multi-beam. The 200 kHz single beam was utlized for the 2014 CBD23-DMU34 survey.

[2]The number of readings (n) which comprise the boxplot datasets are comprised of survey nodes taken along a 5-foot modeled grid.

[3]Combined vertical error estimate using propogation of errors formula $\sqrt{(Error^2_{Survey1} + Error^2_{Survey2})}$ applying the manufacturers vertical error estimate of 0.25 ft. for the 400 kHz multi-beam survey and 0.15 ft. for the 200 kHz single beam survey.

Cap areas are shown in order from upstream to downstream.

Foth

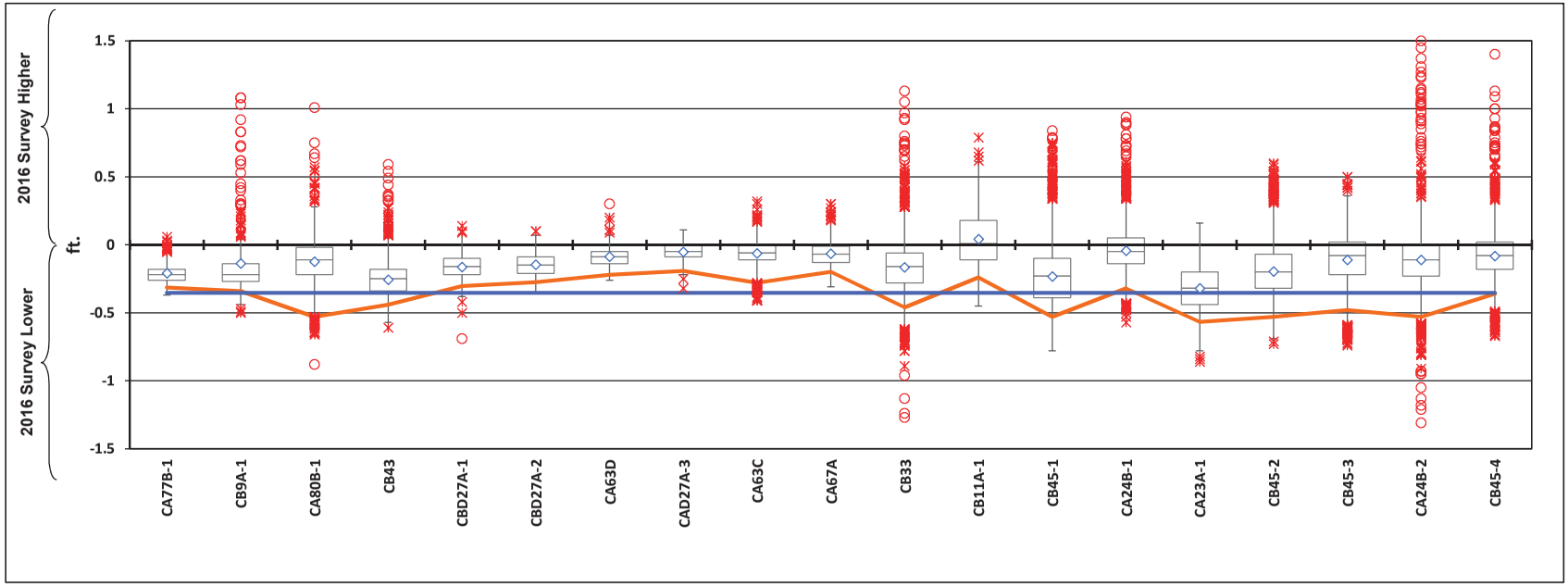
LOWER FOX RIVER REMEDIATION LLC

FIGURE 15A
DISTRIBTUIONS OF SURVEY DIFFERENCES
FOR 2016 AND 2014

Date: DECEMBER 2016	Revision Date:	
Drawn By: SGL	Checked By: TMK1	Scope: 16L029

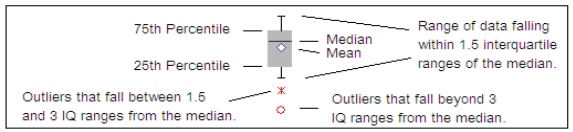
Path: X:\FOTH\IE\Lower Fox River Remediation\16L029-00\4000 Regulatory\OU4 COMMP Year 2\OU4 COMMP Year 2 AOT Document\Stats data\2016_to_2014 All Areas.xlsx

Boxplot Distributions of Survey Differences for 2016 Minus 2014 (400 kHz Multi-Beam[1])



n[2]:	250	270	528	7904	1091	227	269	152	757	1045	4726	1329	6051	2386	526	4165	5622	2783	4694
5th Percentile:	-0.31	-0.34	-0.53	-0.44	-0.30	-0.28	-0.22	-0.19	-0.28	-0.20	-0.46	-0.24	-0.53	-0.32	-0.57	-0.53	-0.48	-0.53	-0.36
50th Percentile:	-0.22	-0.22	-0.11	-0.25	-0.16	-0.15	-0.09	-0.05	-0.06	-0.07	-0.16	0.01	-0.23	-0.05	-0.32	-0.20	-0.08	-0.11	-0.08
95th Percentile:	-0.03	0.43	0.26	-0.07	-0.04	0.02	0.04	0.08	0.10	0.09	0.12	0.41	0.10	0.24	-0.05	0.13	0.17	0.21	0.16
Vertical Error[3]:	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35

Boxplot Legend:



Notes: [1]Localized portions of CBD23-DMU27, CAD118 and CB33 had less than 3 feet of water in 2014, and a single beam echo sounder was used in place of the multi-beam. The 200 kHz single beam was utlized for the 2014 CBD23-DMU34 survey.

[2]The number of readings (n) which comprise the boxplot datasets are comprised of survey nodes taken along a 5-foot modeled grid.

[3]Combined vertical error estimate using propogation of errors formula $\sqrt{(Error^2_{Survey1} + Error^2_{Survey2})}$ applying the manufacturers vertical error estimate of 0.25 ft. for the 400 kHz multi-beam survey and 0.15 ft. for the 200 kHz single beam survey.

Cap areas are shown in order from upstream to downstream.

Foth

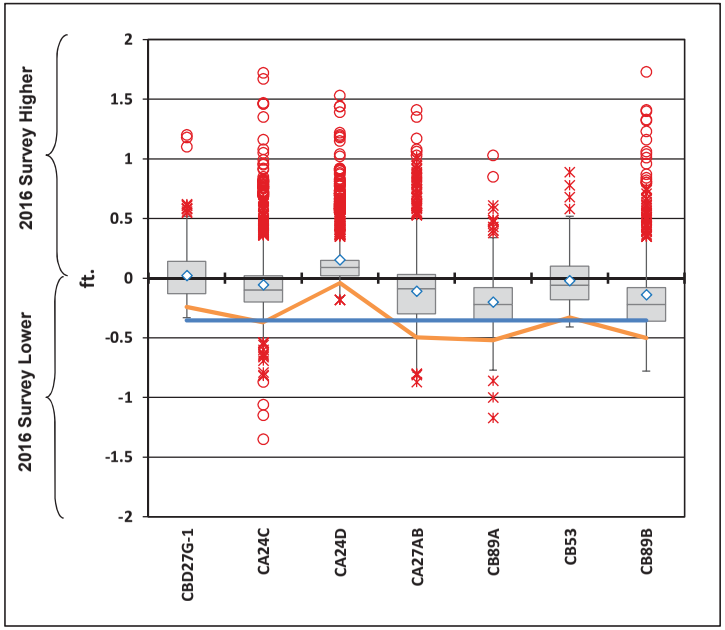
LOWER FOX RIVER REMEDIATION LLC

FIGURE 15B
DISTRIBTUIONS OF SURVEY DIFFERENCES
FOR 2016 AND 2014

Date: DECEMBER 2016	Revision Date:	
Drawn By: SGL	Checked By: TMK1	Scope: 16L029

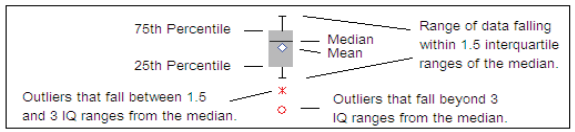
Path: X:\FOTH\IE\Lower Fox River Remediation\16L029-00\4000 Regulatory\OU4 COMMP Year 2\OU4 COMMP Year 2 AOT Document\Stats data\2016_to_2014 All Areas.xlsx

Boxplot Distributions of Survey Differences for 2016 Minus 2014 (400 kHz Multi-Beam[1])



n[2]:	465	1290	973	1925	459	156	574
5th Percentile:	-0.24	-0.37	-0.04	-0.50	-0.52	-0.33	-0.50
50th Percentile:	-0.01	-0.10	0.09	-0.09	-0.22	-0.06	-0.22
95th Percentile:	0.44	0.51	0.65	0.35	0.27	0.49	0.61
Vertical Error[3]:	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35	-0.35

Boxplot Legend:



Notes: [1]Localized portions of CBD23-DMU27, CAD118 and CB33 had less than 3 feet of water in 2014, and a single beam echo sounder was used in place of the multi-beam. The 200 kHz single beam was utlized for the 2014 CBD23-DMU34 survey.

[2]The number of readings (n) which comprise the boxplot datasets are comprised of survey nodes taken along a 5-foot modeled grid.

[3]Combined vertical error estimate using propogation of errors formula $\sqrt{(Error^2_{Survey1} + Error^2_{Survey2})}$ applying the manufacturers vertical error estimate of 0.25 ft. for the 400 kHz multi-beam survey and 0.15 ft. for the 200 kHz single beam survey.

Cap areas are shown in order from upstream to downstream.

Foth

LOWER FOX RIVER REMEDIATION LLC

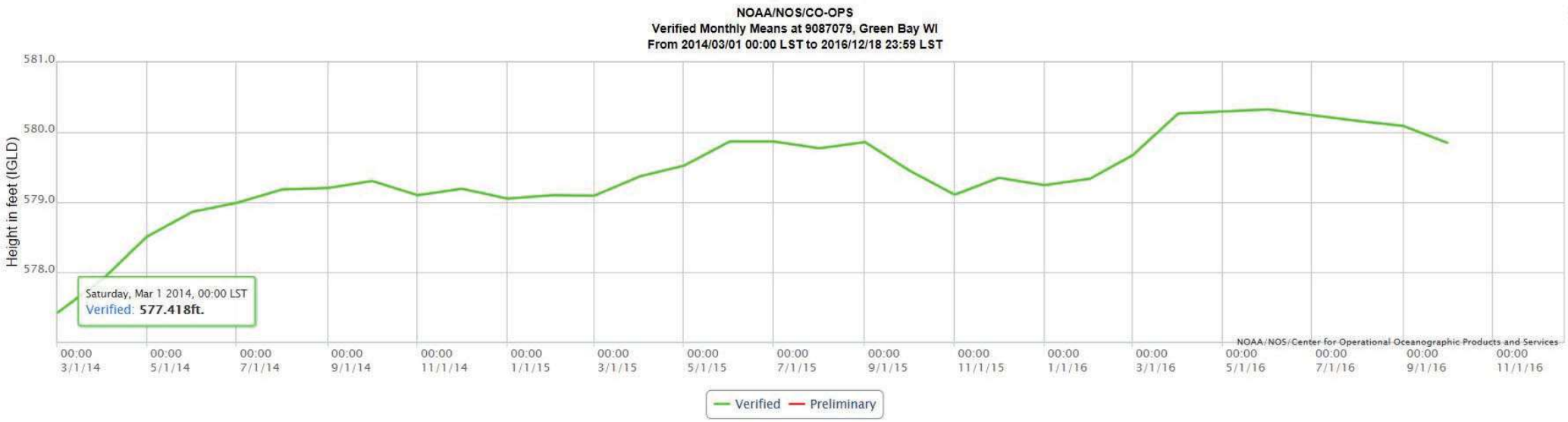
FIGURE 15C
DISTRIBTUIONS OF SURVEY DIFFERENCES
FOR 2016 AND 2014

Date: DECEMBER 2016	Revision Date:	
Drawn By: SGL	Checked By: TMK1	Scope: 16L029

Path: X:\FOTH\IE\Lower Fox River Remediation\16L029-00\4000 Regulatory\OU4 COMMP Year 2\OU4 COMMP Year 2 AOT Document\Stats data\2016_to_2014 All Areas.xlsx

Attachment A

NOAA Monthly Water Elevation Data for Green Bay Station No. 9087079



Options for

9087079 Green Bay, WI

From:

Mar 1 2014

To:

Dec 18 2016

Units

Feet

Timezone

LST

Datum

IGLD

Shift dates

Back 1 Month | Forward 1 Month

Interval

6 min | 1 hr | H/L | Day | Month

Update

Plot | Data Only

Water Elevations at NOAA Station No. 9087079

Year	Month	Highest Monthly Water Elevation (feet IGLD)	Verified Monthly Mean Water Elevation (feet IGLD)	Lowest Monthly Water Elevation (feet IGLD)
2014	3	578.320	577.418	576.572
2014	4	579.800	577.903	576.926
2014	5	579.409	578.508	577.562
2014	6	579.787	578.863	577.707
2014	7	580.190	578.990	578.087
2014	8	579.987	579.182	578.540
2014	9	581.211	579.202	577.408
2014	10	581.549	579.303	577.887
2014	11	581.568	579.099	577.582
2014	12	580.272	579.192	577.703
2015	1	580.000	579.051	577.379
2015	2	580.069	579.099	577.651
2015	3	579.813	579.092	577.881
2015	4	580.423	579.368	578.071
2015	5	580.896	579.522	578.488
2015	6	581.450	579.866	579.249
2015	7	581.348	579.867	579.058
2015	8	581.033	579.770	578.855
2015	9	580.833	579.858	578.907
2015	10	581.030	579.454	578.258
2015	11	580.768	579.107	577.188
2015	12	582.631	579.348	577.516
2016	1	581.125	579.243	578.002
2016	2	580.856	579.335	577.785
2016	3	582.251	579.671	577.615
2016	4	581.959	580.267	578.937
2016	5	581.437	580.295	579.534
2016	6	581.348	580.325	579.459
2016	7	581.335	580.243	579.419
2016	8	581.184	580.161	579.301
2016	9	581.096	580.089	578.724
2016	10	581.266	579.846	578.730

Data from NOAA: https://www.co-ops.nos.noaa.gov/waterlevels.html?id=9087079

Attachment B

Foth Field Notes for:

October 18-19, 2016 and December 1, 2016 Multi-Beam Year 2 Surveys; October 25, 2016 Single Beam Year 2 Survey; and November 3-4, 2016 Poling/Probing Survey

Table 1 – OU4 Year 2 Poling/Probing Deposition Measurements

Owner: Lower Fox River Remediation LLC
Project: Lower Fox River OU2-5 RA
Prepared by: Brad Kussman
Checked by: Jim Buchberger

Project #: 16L029
Date: 11-28-16
Date: 11-29-16

Hydrographic Survey Audit Form

Date of Survey: 10-18-16
HYPACK Project Name: OU4 Long Term Monitoring Multi-beam Survey
Area(s) Surveyed: 161018 OU4 2014 Cap Areas

Captain: Ryan Sands
Technicians: Brad Kussman
Boat Name: 7749
Trimble RTK GPS Equipment: Trimble R5
Type of Survey:

- [ ] Pre-Dredge
- [ ] Pre-Sand/Cap
- [ ] Post-Dredge
- [x] Post-Sand/Cap

Weather Conditions				
Time	Wave Heights	Wind Spd/Dir	Temp °F	Cloud Cover
1000	0-1'	5-10 W/NW	60	Partly

Control Data			
Pt. Name	Northing	Easting	Elevation
OU4-05A	247914.012	2482665.352	591.131
OU4-05A	247913.998	2482665.377	591.117

Minimum of 2 control points to be checked at both Start and End.	Check IN (at start)	Check OUT (at end)
Time	10:24	16:57
Point Name	OU4-05A	OU4-05A
Δ Horizontal:	0.036	0.065
V. Vertical:	0.005	0.009
Vertical and Horizontal within 0.13 ft. of published value		
Tide Elevation:	579.35	580.08
Time:	10:31	16:52

Sonic Sounder Calibration/Bar Check Information
Sounder # 2020
Transducer at 400 Hz

Latency: 0	**Date:** 10-18-16
Vertical Offset: NA	**Draft:** 1.10

Plan Lines for Cross Lines: [x] (check when added)

	Bar Check			
	(at start)		(at end)	
	Bar at	Fatho-meter (0.1 ft)	Bar at	Fatho-meter (0.1 ft)
Min. 2 ft below transducer (ft)	2	2	2	2
Min. 5 ft below transducer (ft)	5	5	5	5
Min 10 ft below transducer (ft)	10	10	10	10
Min 15 ft below transducer (ft)				
Min 20 ft below transducer (ft)				
Nearest ft. to bottom (ft)				
Speed of Sound Velocity Reading (ft/sec)	4816		4816	
Time when bar check made (hrs)	10:54		16:40	

Polings			
Poling points to be evenly distributed within the area of survey.	Area:		
	Pt. #	Pole Depth (0.1 ft)	Fathometer
Pre-Dredge Surveys – Min. 1 poling per hour	1	13.0	13.0
	2	11.7	11.7
Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.	3	11.1	11.1
	4	9.0	9.0
	5	11.1	11.1
	6		
	7		
	8		
	9		

Additional Notes:

Owner: Lower Fox River Remediation LLC
Project: Lower Fox River OU2-5 RA
Prepared by: Brad Kussman
Checked by: Jim Buchberger

Project #: 16L029
Date: 11-28-16
Date: 11-29-16

Hydrographic Survey Audit Form

Date of Survey: 10-19-16
HYPACK Project Name: OU4 Long Term Monitoring Multi-beam Survey
Area(s) Surveyed: 161019 OU4 2014 Cap Areas

Captain: Ryan Sands
Technicians: Brad Kussman
Boat Name: 7749
Trimble RTK GPS Equipment: Trimble R5
Type of Survey:

- [ ] Pre-Dredge
- [ ] Pre-Sand/Cap
- [ ] Post-Dredge
- [x] Post-Sand/Cap

Weather Conditions				
Time	Wave Heights	Wind Spd/Dir	Temp °F	Cloud Cover
1000	0-1'	2-7 W	60	Partly

Control Data			
Pt. Name	Northing	Easting	Elevation
OU4-05A	247913.988	2482665.365	591.117
OU4-05A	247913.971	2482665.355	591.10

Minimum of 2 control points to be checked at both Start and End.	Check IN (at start)	Check OUT (at end)
Time	11:39	16:43
Point Name	OU4-05A	OU4-05A
Δ Horizontal:	0.062	0.069
V. Vertical:	0.009	0.022
Vertical and Horizontal within 0.13 ft. of published value		
Tide Elevation:	579.94	580.21
Time:	11:44	16:39

Sonic Sounder Calibration/Bar Check Information
Sounder # 2020
Transducer at 400 Hz

Latency: 0	**Date:** 10-19-16
Vertical Offset: NA	**Draft:** 1.10

Plan Lines for Cross Lines: [x] (check when added)

	Bar Check			
	(at start)		(at end)	
	Bar at	Fatho-meter (0.1 ft)	Bar at	Fatho-meter (0.1 ft)
Min. 2 ft below transducer (ft)	2	2	2	2
Min. 5 ft below transducer (ft)	5	5	5	5
Min 10 ft below transducer (ft)	10	10	10	10
Min 15 ft below transducer (ft)				
Min 20 ft below transducer (ft)				
Nearest ft. to bottom (ft)				
Speed of Sound Velocity Reading (ft/sec)	4823		4823	
Time when bar check made (hrs)	12:00		16:30	

Polings			
Poling points to be evenly distributed within the area of survey.	Area:		
	Pt. #	Pole Depth (0.1 ft)	Fathometer
Pre-Dredge Surveys – Min. 1 poling per hour	1	11.1	11.1
	2	12.4	12.4
Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.	3	9.2	9.2
	4	10.3	10.3
	5		
	6		
	7		
	8		
	9		

Additional Notes:

Foth

Owner: Lower Fox River Remediation LLC
Project: Lower Fox River OU2-5 RA
Prepared by: SAM FRISBIE
Checked by: Jim Buchberger

Project #: 16L029
Date: 10/25/16
Date: 12-5-16

Hydrographic Survey Audit Form

Date of Survey: 10/25/16
HYPACK Project Name: OU4 LTM SBES FALL IN
Area(s) Surveyed: LTM AREAS

Captain: J. WILKS
Technicians: " "
Boat Name: JFB 7750
Trimble RTK GPS Equipment: R5 UNIT
Type of Survey:

- [ ] Pre-Dredge
- [ ] Pre-Sand/Cap
- [ ] Post-Dredge
- [x] Post-Sand/Cap (LTM)

Minimum of 2 control points to be checked at both Start and End.	Check IN (at start)	Check OUT (at end)
Time	1241	1811
Point Name	OU4-05A	OU4-05A
Δ Horizontal:	0.026	0.035
V. Vertical:	-0.027	-0.004
Vertical and Horizontal within 0.13 ft. of published value		
Tide Elevation:	579.739	580.223
Time:	1246	1805

Plan Lines for Cross Lines: [ ] (check when added)

	Bar Check (at start) Bar at	Bar Check (at start) Fathometer (0.1 ft)	Bar Check (at end) Bar at	Bar Check (at end) Fathometer (0.1 ft)
Min. 2 ft below transducer (ft)	5	5	5	5
Min. 5 ft below transducer (ft)	10	10	10	10
Min 10 ft below transducer (ft)	15	15	15	15
Min 15 ft below transducer (ft)	—	—	19	19
Min 20 ft below transducer (ft)	—	—	—	—
Nearest ft. to bottom (ft)	15	15	19	19
Speed of Sound Velocity Reading (ft/sec)	4779		4779	
Time when bar check made (hrs)	1252		1745	

Weather Conditions				
Time	Wave Heights	Wind Spd/Dir	Temp °F	Cloud Cover
1505	CALM	4-7mph NE	50	CLEAR

Control Data			
Pt. Name	Northing	Easting	Elevation
OU4-05A	247914.025	2482665.345	591.099
OU4-05A	247914.018	2482665.353	591.122

Sonic Sounder Calibration/Bar Check Information
Sounder # 320
Transducer at 200/20 Hz w/ beam width of 9.0°

Latency: -		Date: -	
Vertical Offset: 8.19'		Draft: 0.41	

Polings			
Poling points to be evenly distributed within the area of survey.	Area: LTM		
	Pt. #	Pole Depth (0.1 ft)	Fathometer
Pre-Dredge Surveys – Min. 1 poling per hour	1	4.5	4.5
	2	7.0	7.0
Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.	3	7.8	7.8
	4	9.2	9.2
	5	8.1	8.1
	6	4.3	4.3
	7	8.9	8.9
	8	3.8	3.8
	9	4.2	4.2

Additional Notes:

Client: Lower Fox River Remediation LLC
Project: Lower Fox River OU 2-5 RA
Prepared by: SAM FRISBIE
Checked by: Jim Buchberger

Project #: 16L029
Page: 1 of 1
Date: 10/25/16
Date: 12-5-16

Survey Audit Activity Log (Additional Polings)

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1	3.1	3.1
2	4.8	4.8
3	5.3	5.3
4	4.1	4.1
5	4.0	4.0
6	3.6	3.6

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1	4.0	
2	3.6	
3	8.7	
4		
5		
6		

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1		
2		
3		
4		
5		
6		

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1		
2		
3		
4		
5		
6		

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1		
2		
3		
4		
5		
6		

Polings

Poling points to be evenly distributed within the area of survey.

Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.

Pre-Dredge Surveys – Min. 1 poling per hour

AREA:

Pt. #	Pole Depth (0.1 ft)	Fathometer
1		
2		
3		
4		
5		
6		

Foth

Owner: Lower Fox River Remediation LLC
Project: Lower Fox River OU2-5 RA
Prepared by: Brad Kussman
Checked by: Jim Buchberger

Project #: 16L029
Date: 12-1-16
Date: 12-2-16

Hydrographic Survey Audit Form

Date of Survey: 12-1-16
HYPACK Project Name: **OU4 Long Term Monitoring Multi-beam Survey**
Area(s) Surveyed: **161201 OU4 2014 Cap Areas**

Captain: Ryan Sands
Technicians: Brad Kussman
Boat Name: 7749
Trimble RTK GPS Equipment: Trimble R5
Type of Survey:

- [ ] Pre-Dredge
- [ ] Pre-Sand/Cap
- [ ] Post-Dredge
- [x] Post-Sand/Cap

Weather Conditions				
Time	Wave Heights	Wind Spd/Dir	Temp °F	Cloud Cover
1000	0-1'	2-5 NW	38	Partly

Control Data			
Pt. Name	Northing	Easting	Elevation
OU4-05A	247914.015	2482665.337	591.12
OU4-05A	247913.989	2482665.349	591.12

Minimum of 2 control points to be checked at both Start and End.	Check IN (at start)	Check OUT (at end)
Time	10:05	11:34
Point Name	OU4-05A	OU4-05A
Δ Horizontal:	0.023	0.050
V. Vertical:	0.004	0.005
Vertical and Horizontal within 0.13 ft. of published value		
Tide Elevation:	579.34	579.55
Time:	10:10	11:29

Sonic Sounder Calibration/Bar Check Information
Sounder # 2020
Transducer at 400 Hz

Latency: 0	**Date:** 12-1-16
Vertical Offset: NA	**Draft:** 1.10

Plan Lines for Cross Lines: [x] **(check when added)**

	Bar Check			
	(at start)		(at end)	
	Bar at	Fatho-meter (0.1 ft)	Bar at	Fatho-meter (0.1 ft)
Min. 2 ft below transducer (ft)	2	2	2	2
Min. 5 ft below transducer (ft)	5	5	5	5
Min 10 ft below transducer (ft)	10	10	10	10
Min 15 ft below transducer (ft)	12	12		
Min 20 ft below transducer (ft)				
Nearest ft. to bottom (ft)				
Speed of Sound Velocity Reading (ft/sec)	4697		4697	
Time when bar check made (hrs)	10:10		11:12	

Polings			
Poling points to be evenly distributed within the area of survey.	Area:		
	Pt. #	Pole Depth (0.1 ft)	Fathometer
Pre-Dredge Surveys – Min. 1 poling per hour	1	9.3	9.2
	2	10.1	10.1
Post-Dredge Surveys - Min. of 3 polings required per certification unit or per day or more depending on specific project requirements.	3	10.1	10.1
	4		
	5		
	6		
	7		
	8		
	9		

Additional Notes:

Client: Lower Fox River Remediation LLC
Project: Lower Fox River OU4 COMMP
Prepared by: Brad Kussman
Checked by: Tara Van Hoof

Project #: 16L029
Page: 1 of 1
Date: 11/3/2016
Date: 12/6/2016

Field Activity Observation Report

RA Activity **OU4 COMMP Sediment Thickness Measurement/Cap Integrity Assessment**

Location OU4 2014 Cap Areas

	Temp (° F)		Sky Cond.	Precip. (in.)			Site Conditions (describe)	
	Low	High			Rain	Snow	Dry	Muddy
WEATHER	40	58	M. Cloudy		-	-	-	-

Wind 2-5 West

Contractors on site *(include no. of personnel per contractor)*

Brad Kussman (BLK)	Sampling Crew
Brandon Wotachek (BJW1)	Sampling Crew
Sam Frisbie (SXF)	Sampling Crew

Other personnel on site:	***Purpose:***
Andrew Millspaugh - NRT	Oversight

Work observation report, comments:

0700 – Team arrived at the Riverway Marina and boarded the Foth sampling vessel.

0710 – Team departed the Riverway Marina for the Brown County Boat Launch to control point.

0725 – Team arrived at the Brown County boat launch and began preparing the sampling vessel for poling in OU4.

0829 – BLK checked into control point OU4-01R.

Northing: 234115.115
Easting: 2472856.724
Elevation: 586.032
Δ Horizontal: 0.050
Δ Vertical: 0.010

0842 – BLK surveyed tide elevation (580.074').

0845-1640 – The team visited 100 poling locations, armor stone was confirmed.

1655 – The team arrived back at the Brown County boat launch.

1700 – BLK surveyed tide elevation (579.781').

Field Activity Observation Report

1712 – BLK checked out at control point OU4-01R.

Northing: 234115.078
Easting: 2472856.704
Elevation: 586.035
Δ Horizontal: 0.038
Δ Vertical: 0.007

1725 – The sampling team arrived at the Riverway Marina and secured the boat for future activities.

1730 – The sampling team departed the Riverway Marina for the Foth garage.

1745 – The sampling team arrived at the Foth garage, unloaded survey equipment and departed for the day.

Client: Lower Fox River Remediation LLC
Project: Lower Fox River OU4 COMMP
Prepared by: Brad Kussman
Checked by: Tara Van Hoof

Project #: 16L029
Page: 1 of 1
Date: 11/4/2016
Date: 12/6/2016

Field Activity Observation Report

RA Activity **OU4 COMMP Sediment Thickness Measurement/Cap Integrity Assessment**

Location OU4 2014 Cap Areas

WEATHER	Temp (° F)		Sky Cond.	Precip. (in.)			Site Conditions (describe)	
	Low	High			Rain	Snow	Dry	Muddy
	35	59	Sunny		-	-	-	-

Wind 2-5 South West

Contractors on site *(include no. of personnel per contractor)*

Brad Kussman (BLK)	Sampling Crew
Brandon Wotachek (BJW1)	Sampling Crew
Sam Frisbie (SXF)	Sampling Crew

Other personnel on site:	***Purpose:***
Jennifer Hagen - NRT	Oversight

Work observation report, comments:

0720 – Foth Team arrived at the Riverway Marina and boarded the Foth sampling vessel.

0730 – Foth Team departed the Riverway Marina for the Brown County Boat Launch to control point.

0800 – Team arrived at the Brown County boat launch and began preparing the sampling vessel for poling in OU4. Jennifer Hagen arrived as well from NRT.

0846 – BLK checked into control point OU4-01R.

Northing: 234115.114
Easting: 2472856.712
Elevation: 586.046
Δ Horizontal: 0.039
Δ Vertical: 0.004

0848 – BLK surveyed tide elevation (579.840').

0900-1535 – The team visited 62 poling locations, armor stone was confirmed.

1540 – The team arrived back at the Brown County boat launch.

1542 – BLK surveyed tide elevation (579.657').

Field Activity Observation Report

1544 – BLK checked out at control point OU4-01R.

Northing: 234115.088
Easting: 2472856.728
Elevation: 586.036
Δ Horizontal: 0.055
Δ Vertical: 0.006

1550 – The sampling team disassembled sampling vessel for transport back to Foth garage.

1610 – The sampling team departed the Brown County boat launch for the Foth garage.

1630 – The sampling team arrived at the Foth garage, unloaded survey equipment and departed for the day.

Table 1
OU4 Year 2 Poling/Probing Deposition Measurements

Location	Proposed Easting	Proposed Northing	Actual Easting	Actual Northing	Deck Elevation (ft)	Time	Date	Water Depth (ft)	Depth of Hard Push (ft)	Total Sediment Thickness (ft)	Offset
P1	2472995.00	230685.00	2472995.15	230682.86	582.40	8:51am	11/3/2016	12.30	12.80	0.50	2.15
P2	2473000.00	230825.00	2473000.02	230825.75	582.42	8:56am	11/3/2016	14.40	14.70	0.30	0.75
P3	2472895.00	230790.00	2472896.13	230790.85	582.37	9:01am	11/3/2016	13.10	13.30	0.20	1.41
P4	2472785.00	230840.00	2472783.58	230838.95	582.34	9:04am	11/3/2016	11.40	11.60	0.20	1.77
P5	2472610.00	231050.00	2472609.35	231048.97	582.38	9:07am	11/3/2016	14.40	15.10	0.70	1.22
P6	2472745.00	231025.00	2472743.58	231027.83	582.37	9:10am	11/3/2016	18.50	18.60	0.10	3.17
P7	2472950.00	231220.00	2472949.56	231221.80	582.40	9:15am	11/3/2016	23.50	24.40	0.90	1.85
P8 sor	2472780.00	231220.00	2472779.78	231220.78	582.42	9:18am	11/3/2016	23.40	25.50	2.10	0.81
P9 sor	2472610.00	231220.00	2472609.51	231221.01	582.43	9:21am	11/3/2016	22.70	24.30	1.60	1.12
P10 sor	2472590.00	231375.00	2472588.93	231374.96	582.43	9:25am	11/3/2016	24.10	26.30	2.20	1.07
P11 sog	2472700.00	231355.00	2472701.14	231354.35	582.36	10:20am	11/4/2016	24.60	28.00	3.40	1.31
P12 sog	2472780.00	231390.00	2472781.96	231389.33	582.31	10:44am	11/4/2016	26.70	28.10	1.40	2.07
P13	2472950.00	231390.00	2472948.93	231391.58	582.10	10:53am	11/4/2016	29.00	29.80	0.80	1.91
P14 sog	2472695.00	231455.00	2472694.00	231456.69	582.34	10:39am	11/4/2016	25.60	27.80	2.20	1.96
P15	2472950.00	231560.00	2472951.30	231563.50	582.40	10:57am	11/4/2016	27.10	27.30	0.20	3.73
P16	2472780.00	231560.00	2472778.66	231562.33	582.17	10:33am	11/4/2016	29.20	29.90	0.70	2.69
P17	2472890.00	231720.00	2472890.55	231720.32	582.13	11:05am	11/4/2016	26.40	27.40	1.00	0.64
P18 sor	2473110.00	231620.00	2473110.26	231622.06	582.11	11:15am	11/4/2016	25.00	26.80	1.80	2.08
P19 sor	2473460.00	231470.00	2473462.55	231469.20	582.22	11:32am	11/4/2016	18.60	19.40	0.80	2.67
P20	2473570.00	231465.00	2473568.92	231464.97	582.24	11:37am	11/4/2016	15.10	15.20	0.10	1.08
P21 sor	2473600.00	231550.00	2473597.30	231550.46	582.17	15:31pm	11/4/2016	17.00	18.00	1.00	2.74
P22	2473460.00	231560.00	2473461.95	231559.41	582.15	11:30am	11/4/2016	15.00	15.00	0.00	2.04
P23	2473290.00	231560.00	2473297.87	231563.98	581.99	11:20am	11/4/2016	25.60	25.60	0.00	8.82
P24	2473385.00	231590.00	2473384.48	231591.98	582.12	11:25am	11/4/2016	24.20	25.00	0.80	2.05
P25	2473530.00	231655.00	2473527.12	231654.25	582.24	11:41am	11/4/2016	13.00	13.10	0.10	2.98
P26	2473460.00	231730.00	2473460.05	231728.40	582.05	12:24pm	11/4/2016	13.30	13.30	0.00	1.60
P27	2473630.00	231730.00	2473632.49	231727.96	582.20	12:16pm	11/4/2016	16.90	17.40	0.50	3.22
P28	2473625.00	231875.00	2473625.00	231874.24	582.50	9:42am	11/3/2016	13.40	13.40	0.00	0.76
P29	2473465.00	231865.00	2473462.44	231865.40	582.16	12:21pm	11/4/2016	12.70	12.80	0.10	2.59
P30	2473315.00	231945.00	2473313.93	231944.44	582.70	9:59am	11/3/2016	24.60	25.00	0.40	1.21
P31	2473340.00	232000.00	2473338.60	231999.76	582.68	9:56am	11/3/2016	23.70	24.20	0.50	1.42
P32	2473440.00	231985.00	2473439.98	231982.35	582.65	9:53am	11/3/2016	13.80	13.80	0.00	2.65
P33 sog	2473495.00	232035.00	2473494.46	232036.69	582.62	9:51am	11/3/2016	15.60	16.80	1.20	1.77

Table 1
OU4 Year 2 Poling/Probing Deposition Measurements

Location	Proposed Easting	Proposed Northing	Actual Easting	Actual Northing	Deck Elevation (ft)	Time	Date	Water Depth (ft)	Depth of Hard Push (ft)	Total Sediment Thickness (ft)	Offset
P34	2473630.00	232070.00	2473631.22	232068.62	582.58	9:49am	11/3/2016	12.80	12.80	0.00	1.84
P35	2473780.00	231985.00	2473781.08	231982.92	582.52	9:45am	11/3/2016	12.00	12.40	0.40	2.34
P36	2473435.00	232125.00	2473433.85	232124.41	582.72	10:01am	11/3/2016	21.60	21.90	0.30	1.29
P37	2473380.00	232125.00	2473379.09	232124.81	582.75	10:03am	11/3/2016	24.50	24.70	0.20	0.93
P38	2471600.00	233210.00	2471601.60	233209.24	582.10	10:15am	11/4/2016	8.80	8.80	0.00	1.77
P39	2471700.00	233280.00	2471694.42	233280.22	582.09	10:10am	11/4/2016	9.40	9.40	0.00	5.58
P40	2471655.00	233305.00	2471657.31	233306.42	582.13	10:13am	11/4/2016	7.10	7.40	0.30	2.71
P41	2472200.00	233415.00	2472201.70	233414.76	582.20	10:07am	11/4/2016	6.70	6.70	0.00	1.72
P42	2472170.00	233505.00	2472168.98	233507.28	582.20	10:04am	11/4/2016	8.10	8.20	0.10	2.50
P43	2472320.00	233505.00	2472322.82	233506.39	582.25	10:00am	11/4/2016	7.30	7.40	0.10	3.14
P44	2474175.00	233405.00	2474176.99	233406.97	582.28	12:30pm	11/4/2016	26.10	26.50	0.40	2.80
P45	2474240.00	233375.00	2474239.93	233376.65	582.07	12:38pm	11/4/2016	25.60	25.70	0.10	1.65
P46	2474220.00	233430.00	2474222.24	233429.69	582.17	12:34pm	11/4/2016	26.40	26.50	0.10	2.26
P47	2474345.00	233535.00	2474347.32	233536.17	582.13	12:42pm	11/4/2016	26.00	26.60	0.60	2.60
P48	2474480.00	233660.00	2474481.91	233660.46	582.13	12:46pm	11/4/2016	17.20	17.40	0.20	1.96
P49	2474530.00	233770.00	2474532.30	233771.24	582.25	12:50pm	11/4/2016	22.40	22.60	0.20	2.61
P50	2474625.00	233980.00	2474625.68	233981.14	582.15	12:55pm	11/4/2016	24.30	24.80	0.50	1.33
P51	2474580.00	234125.00	2474580.96	234124.50	582.85	10:11am	11/3/2016	20.70	21.00	0.30	1.08
P52	2474650.00	234110.00	2474651.69	234109.21	582.90	10:15am	11/3/2016	24.70	24.90	0.20	1.87
P53	2474650.00	234280.00	2474649.92	234280.17	582.88	10:18am	11/3/2016	16.60	16.60	0.00	0.19
P54	2474820.00	234280.00	2474822.92	234281.00	582.95	10:22am	11/3/2016	24.80	24.80	0.00	3.09
P55	2474820.00	234450.00	2474822.09	234449.10	582.95	10:24am	11/3/2016	21.70	22.00	0.30	2.28
P56	2474990.00	234450.00	2474991.00	234450.57	582.95	10:26am	11/3/2016	24.20	24.20	0.00	1.15
P57	2475075.00	234505.00	2475076.40	234506.18	582.95	10:35am	11/3/2016	18.10	18.10	0.00	1.83
P58	2475080.00	234585.00	2475080.04	234585.41	582.90	10:38am	11/3/2016	24.00	24.20	0.20	0.41
P59	2474990.00	234620.00	2474989.25	234621.41	582.90	10:41am	11/3/2016	24.50	24.90	0.40	1.60
P60	2474950.00	234715.00	2474951.06	234714.26	582.88	10:44am	11/3/2016	19.60	19.60	0.00	1.29
P61	2475145.00	234700.00	2475147.86	234700.56	582.17	13:00pm	11/4/2016	23.50	23.50	0.00	2.91
P62	2475220.00	234665.00	2475218.26	234666.03	582.05	13:03pm	11/4/2016	19.00	19.30	0.30	2.02
P63	2475160.00	234790.00	2475162.93	234792.22	582.10	13:06pm	11/4/2016	25.10	25.40	0.30	3.68
P64	2474990.00	234790.00	2474990.19	234789.50	582.83	10:46am	11/3/2016	21.20	21.20	0.00	0.53
P65	2475000.00	234830.00	2475000.83	234830.52	582.85	10:49am	11/3/2016	18.80	18.80	0.00	0.98
P66	2474925.00	234850.00	2474923.47	234848.89	582.70	10:52am	11/3/2016	14.90	14.90	0.00	1.89

Table 1
OU4 Year 2 Poling/Probing Deposition Measurements

Location	Proposed Easting	Proposed Northing	Actual Easting	Actual Northing	Deck Elevation (ft)	Time	Date	Water Depth (ft)	Depth of Hard Push (ft)	Total Sediment Thickness (ft)	Offset
P67	2474915.00	234920.00	2474913.74	234919.70	582.70	10:55am	11/3/2016	13.40	13.40	0.00	1.30
P68	2474820.00	234960.00	2474818.89	234958.69	582.70	10:58am	11/3/2016	7.70	8.00	0.30	1.72
P69	2475030.00	234890.00	2475030.55	234891.37	582.67	11:02am	11/3/2016	14.50	14.50	0.00	1.48
P70	2475040.00	234940.00	2475040.76	234937.59	582.65	11:04am	11/3/2016	13.80	14.00	0.20	2.53
P71	2475160.00	234960.00	2475162.81	234961.03	582.55	11:10am	11/3/2016	20.00	20.00	0.00	2.99
P72	2475205.00	235035.00	2475206.63	235037.35	582.18	13:10pm	11/4/2016	16.90	17.10	0.20	2.86
P73	2475245.00	235135.00	2475244.80	235134.92	582.48	11:28am	11/3/2016	15.10	15.10	0.00	0.22
P74	2475280.00	235270.00	2475281.79	235268.99	582.56	11:31am	11/3/2016	11.00	11.00	0.00	2.06
P75	2475380.00	235280.00	2475380.00	235282.79	582.52	11:35am	11/3/2016	19.30	19.50	0.20	2.79
P76	2475380.00	235030.00	2475382.14	235028.51	582.60	11:22am	11/3/2016	22.70	22.70	0.00	2.61
P77	2475440.00	235120.00	2475439.42	235120.30	582.55	11:25am	11/3/2016	23.20	23.20	0.00	0.65
P78	2475435.00	234990.00	2475436.44	234990.93	582.53	11:19am	11/3/2016	21.40	21.40	0.00	1.71
P79	2475455.00	235080.00	2475455.31	235080.59	582.62	11:16am	11/3/2016	22.40	22.40	0.00	0.67
P80	2475480.00	235300.00	2475480.03	235298.97	582.53	11:41am	11/3/2016	23.90	24.00	0.10	1.03
P81	2475395.00	235360.00	2475394.30	235359.12	582.44	11:37am	11/3/2016	19.90	19.90	0.00	1.12
P82	2475500.00	235512.00	2475498.73	235512.42	582.90	12:14pm	11/3/2016	17.60	17.60	0.00	1.34
P83	2475570.00	235470.00	2475569.25	235470.09	583.01	12:17pm	11/3/2016	23.60	23.60	0.00	0.76
P84	2475670.00	235640.00	2475672.44	235639.33	582.28	13:15pm	11/4/2016	21.60	21.70	0.10	2.53
P85	2475690.00	235755.00	2475691.96	235754.15	582.19	13:19pm	11/4/2016	21.50	21.60	0.10	2.14
P86	2475805.00	235835.00	2475807.51	235834.33	582.25	13:21pm	11/4/2016	21.60	21.80	0.20	2.60
P87	2475810.00	235905.00	2475809.80	235904.56	582.20	13:24pm	11/4/2016	23.00	23.00	0.00	0.48
P88	2475895.00	236035.00	2475893.94	236037.45	582.20	13:26pm	11/4/2016	23.50	23.50	0.00	2.67
P89	2476010.00	235980.00	2476011.18	235980.98	582.11	13:30pm	11/4/2016	23.00	23.50	0.50	1.53
P90	2475955.00	236135.00	2475955.22	236133.87	582.37	13:39pm	11/4/2016	23.10	23.50	0.40	1.15
P91	2476010.00	236150.00	2476010.89	236150.73	582.30	13:35pm	11/4/2016	22.80	23.20	0.40	1.15
P92	2476180.00	236150.00	2476181.74	236150.16	582.32	13:42pm	11/4/2016	23.00	23.50	0.50	1.75
P93	2476045.00	236305.00	2476046.84	236303.08	582.35	13:47pm	11/4/2016	21.60	21.90	0.30	2.66
P94	2476180.00	236320.00	2476179.66	236320.82	582.20	13:45pm	11/4/2016	23.30	23.30	0.00	0.89
P95	2476120.00	236410.00	2476117.79	236409.82	583.15	12:25pm	11/3/2016	22.40	22.60	0.20	2.22
P96	2476340.00	236465.00	2476341.85	236464.04	582.40	13:51pm	11/4/2016	24.00	24.00	0.00	2.08
P97	2477130.00	237905.00	2477130.89	237904.35	583.04	12:33pm	11/3/2016	18.50	18.80	0.30	1.10
P98	2477200.00	238020.00	2477201.43	238021.70	583.05	12:35pm	11/3/2016	22.90	23.10	0.20	2.22
P99	2477230.00	238130.00	2477231.93	238130.21	583.05	12:39pm	11/3/2016	20.40	20.60	0.20	1.94

Table 1
OU4 Year 2 Poling/Probing Deposition Measurements

Location	Proposed Easting	Proposed Northing	Actual Easting	Actual Northing	Deck Elevation (ft)	Time	Date	Water Depth (ft)	Depth of Hard Push (ft)	Total Sediment Thickness (ft)	Offset
P100	2477210.00	238260.00	2477210.56	238261.47	583.00	12:42pm	11/3/2016	22.90	23.10	0.20	1.57
P101	2477080.00	238380.00	2477080.14	238379.55	583.00	12:47pm	11/3/2016	18.80	18.90	0.10	0.47
P102	2476985.00	238495.00	2476983.80	238497.87	582.95	12:50pm	11/3/2016	11.80	11.80	0.00	3.11
P103	2476880.00	238545.00	2476879.93	238544.38	582.99	12:52pm	11/3/2016	8.20	8.50	0.30	0.62
P104	2476730.00	238670.00	2476729.81	238669.21	582.93	12:55pm	11/3/2016	6.40	6.40	0.00	0.81
P105	2476665.00	238665.00	2476665.71	238664.90	582.88	12:58pm	11/3/2016	6.80	6.80	0.00	0.72
P106	2476545.00	238705.00	2476545.29	238705.48	582.99	13:00pm	11/3/2016	6.90	7.00	0.10	0.56
P107	2477200.00	238530.00	2477198.19	238532.77	582.85	13:04pm	11/3/2016	22.40	22.40	0.00	3.31
P108 soft	2477195.00	238700.00	2477196.47	238700.28	582.70	13:08pm	11/3/2016	21.70	23.70	2.00	1.50
P108A gravel	2477221.45	238712.67	2477221.45	238712.67	582.6	13:31pm	11/3/2016	22.4	N/A	N/A	27.88
p108b gravel	2477249.55	238728.56	2477249.55	238728.56	582.4	13:40pm	11/3/2016	22.4	N/A	N/A	60.14
P109	2477275.00	238760.00	2477274.85	238759.73	582.65	13:51pm	11/3/2016	22.30	22.40	0.10	0.31
P110	2477370.00	238870.00	2477369.51	238870.78	582.63	14:04pm	11/3/2016	21.90	22.20	0.30	0.92
P111	2477325.00	238975.00	2477322.77	238975.67	582.63	14:15pm	11/3/2016	20.40	20.40	0.00	2.33
P112	2477495.00	238740.00	2477496.04	238742.36	582.62	13:57pm	11/3/2016	23.20	23.60	0.40	2.58
P113	2477540.00	238870.00	2477538.76	238873.32	582.62	14:09pm	11/3/2016	23.80	24.30	0.50	3.54
P114	2477370.00	239040.00	2477374.50	239039.43	582.64	14:19pm	11/3/2016	18.20	18.30	0.10	4.54
P115	2477585.00	239070.00	2477582.96	239071.35	582.65	14:24pm	11/3/2016	24.20	24.40	0.20	2.45
P116	2477445.00	239190.00	2477446.67	239192.00	582.65	14:29pm	11/3/2016	21.90	22.80	0.90	2.61
P117	2477540.00	239210.00	2477541.56	239211.36	582.72	14:33pm	11/3/2016	23.60	23.80	0.20	2.07
P118	2477745.00	239145.00	2477745.01	239148.27	582.78	14:38pm	11/3/2016	20.70	21.10	0.40	3.27
P119	2477710.00	239210.00	2477708.36	239210.77	582.71	14:44pm	11/3/2016	24.70	24.70	0.00	1.81
P120	2477780.00	239265.00	2477781.16	239266.74	582.75	14:47pm	11/3/2016	23.00	23.20	0.20	2.09
P121	2477820.00	239325.00	2477820.25	239326.51	582.80	14:51pm	11/3/2016	22.30	22.80	0.50	1.53
P122	2477880.00	239380.00	2477879.85	239378.91	582.63	14:57pm	11/3/2016	22.20	22.50	0.30	1.10
P123	2477710.00	239380.00	2477710.56	239379.56	582.26	14:03pm	11/4/2016	25.30	25.60	0.30	0.71
P124	2477540.00	239380.00	2477540.73	239381.69	582.83	15:06pm	11/3/2016	17.40	17.60	0.20	1.84
P125	2477415.00	239330.00	2477415.80	239332.06	582.77	15:10pm	11/3/2016	12.40	12.60	0.20	2.21
P126	2477614.00	239550.00	2477614.77	239549.52	582.35	14:10pm	11/4/2016	17.10	17.40	0.30	0.91
P127	2477710.00	239550.00	2477711.92	239551.57	582.21	14:07pm	11/4/2016	25.00	25.00	0.00	2.48
P128	2477880.00	239550.00	2477880.60	239549.45	582.25	14:19pm	11/4/2016	25.70	25.80	0.10	0.81
P129	2477805.00	239605.00	2477805.04	239603.48	582.33	14:16pm	11/4/2016	25.70	26.00	0.30	1.52
P130	2477710.00	239720.00	2477710.55	239719.40	582.25	14:13pm	11/4/2016	15.80	15.80	0.00	0.81

Table 1
OU4 Year 2 Poling/Probing Deposition Measurements

Location	Proposed Easting	Proposed Northing	Actual Easting	Actual Northing	Deck Elevation (ft)	Time	Date	Water Depth (ft)	Depth of Hard Push (ft)	Total Sediment Thickness (ft)	Offset
P131	2477880.00	239720.00	2477878.24	239720.00	582.30	14:23pm	11/4/2016	25.60	25.90	0.30	1.76
P132	2478060.00	239680.00	2478061.41	239679.71	582.34	14:59pm	11/4/2016	19.20	19.20	0.00	1.44
P133	2477880.00	239890.00	2477880.69	239889.10	582.36	14:28pm	11/4/2016	24.70	25.00	0.30	1.13
P134	2478050.00	239890.00	2478050.59	239890.80	582.25	14:51pm	11/4/2016	24.30	24.30	0.00	0.99
P135	2478215.00	239930.00	2478217.21	239929.84	582.33	14:44pm	11/4/2016	18.30	18.30	0.00	2.22
P136	2478220.00	240060.00	2478222.33	240059.83	582.55	16:40pm	11/3/2016	21.20	21.20	0.00	2.34
P137	2478050.00	240060.00	2478051.33	240059.32	582.36	14:41pm	11/4/2016	24.10	24.40	0.30	1.49
P138	2477880.00	240060.00	2477882.13	240059.41	582.38	14:33pm	11/4/2016	14.40	14.60	0.20	2.21
P139	2478005.00	240195.00	2478005.64	240194.86	582.38	14:36pm	11/4/2016	14.70	15.20	0.50	0.66
P140	2478285.00	240190.00	2478287.06	240190.61	582.50	16:36pm	11/3/2016	22.90	22.90	0.00	2.15
P141	2478275.00	240290.00	2478275.59	240291.80	582.55	16:31pm	11/3/2016	20.90	21.30	0.40	1.89
P142	2478065.00	240320.00	2478065.19	240321.26	582.54	16:28pm	11/3/2016	14.10	14.10	0.00	1.27
P143 sor	2478080.00	240355.00	2478079.92	240353.56	582.54	16:23pm	11/3/2016	17.70	19.20	1.50	1.44
P144	2478235.00	240680.00	2478235.99	240680.52	582.46	16:15pm	11/3/2016	14.00	14.00	0.00	1.12
P145	2478340.00	240850.00	2478338.43	240851.41	582.47	16:13pm	11/3/2016	12.90	13.20	0.30	2.11
P146	2478415.00	241015.00	2478414.22	241014.27	582.50	16:11pm	11/3/2016	13.10	13.20	0.10	1.07
P147	2478510.00	240785.00	2478510.23	240785.78	582.45	16:19pm	11/3/2016	15.80	16.00	0.20	0.81
P148	2478625.00	241045.00	2478626.13	241046.34	582.48	16:08pm	11/3/2016	13.90	13.90	0.00	1.75
P149	2478730.00	241250.00	2478729.80	241248.37	582.52	16:05pm	11/3/2016	13.20	13.30	0.10	1.64
P150	2478935.00	241590.00	2478934.22	241589.55	582.58	16:01pm	11/3/2016	11.90	12.20	0.30	0.90
P151	2479052.00	241862.00	2479050.71	241861.35	582.58	15:59pm	11/3/2016	13.00	13.20	0.20	1.44
P152	2479141.00	242020.00	2479138.20	242021.75	582.62	15:57pm	11/3/2016	12.70	13.20	0.50	3.30
P153	2479240.00	242100.00	2479238.51	242100.53	582.62	15:54pm	11/3/2016	12.80	13.20	0.40	1.58
P154	2479585.00	242455.00	2479584.82	242454.75	582.50	15:51pm	11/3/2016	12.30	12.60	0.30	0.31
P155	2479720.00	242560.00	2479721.65	242562.26	582.53	15:48pm	11/3/2016	11.70	11.80	0.10	2.80
P156	2479805.00	242655.00	2479807.74	242654.05	582.60	15:45pm	11/3/2016	13.20	13.60	0.40	2.90
P157	2479905.00	242720.00	2479905.37	242719.55	582.60	15:43pm	11/3/2016	12.60	12.60	0.00	0.58
P158	2479975.00	242780.00	2479976.68	242780.09	582.58	15:40pm	11/3/2016	12.60	12.90	0.30	1.68
P159	2480150.00	242920.00	2480148.97	242917.29	582.67	15:36pm	11/3/2016	12.80	13.00	0.20	2.90

sog = soft over gravel
sor = soft over rock

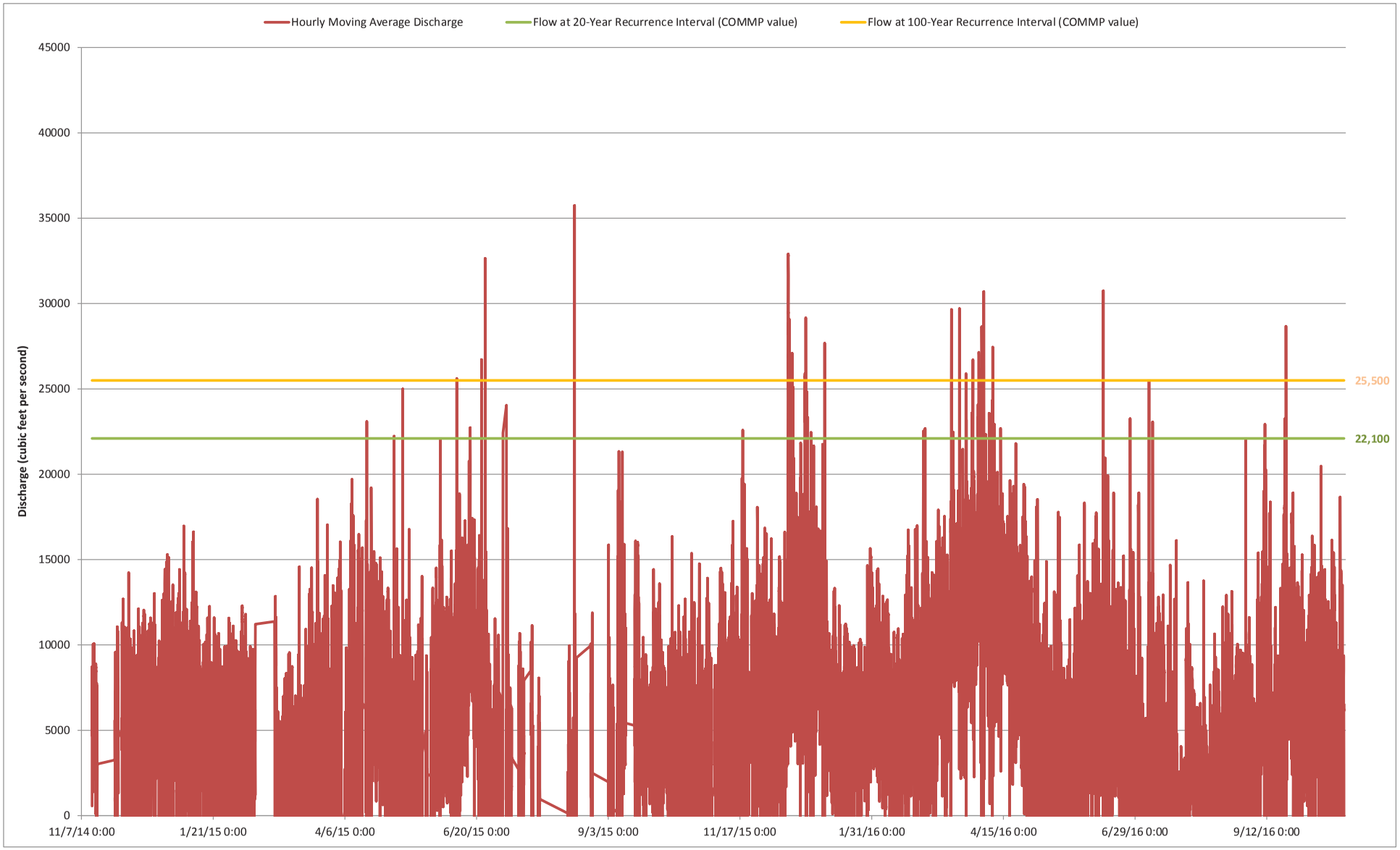
Prepared by: BLK
Checked by: TMK1

Attachment C

USGS Flow Data for Station No. 040851385 – Fox River Oil Tank Depot at Green Bay, WI

FIGURE 1

OU4 USGS 040851385 Fox River Oil Tank Depot at Green Bay, WI



X:\FOTH\IE\Lower Fox River Remediation\16L029-00\4000 Regulatory\OU4 COMMP Year 2\20 year flow eval\USGS 040851385 FOX RIVER AT OIL TANK DEPOT AT GREEN BAY, WI.xlsx

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
4/18/15 11:05 AM	22542		6/24/15 8:40 PM	23081		12/14/15 8:15 AM	26483	26483
4/18/15 11:10 AM	22867		6/24/15 8:45 PM	26453	26453	12/14/15 8:20 AM	26417	26417
4/18/15 11:15 AM	23042		6/24/15 8:50 PM	29392	29392	12/14/15 8:25 AM	26400	26400
4/18/15 11:20 AM	23092		6/24/15 8:55 PM	31425	31425	12/14/15 8:30 AM	26408	26408
4/18/15 11:25 AM	22842		6/24/15 9:00 PM	32642	32642	12/14/15 8:35 AM	26533	26533
4/18/15 11:30 AM	22392		6/24/15 9:05 PM	32542	32542	12/14/15 8:40 AM	26567	26567
5/4/15 12:55 AM	22225		6/24/15 9:10 PM	31992	31992	12/14/15 8:45 AM	26633	26633
5/4/15 1:00 AM	22200		6/24/15 9:15 PM	31300	31300	12/14/15 8:50 AM	26633	26633
5/8/15 10:35 PM	23229		6/24/15 9:20 PM	30033	30033	12/14/15 8:55 AM	26717	26717
5/8/15 10:40 PM	24842		6/24/15 9:25 PM	28208	28208	12/14/15 9:00 AM	26933	26933
5/8/15 10:45 PM	25000		6/24/15 9:30 PM	26325	26325	12/14/15 9:05 AM	26975	26975
5/8/15 10:50 PM	24483		6/24/15 9:35 PM	24433		12/14/15 9:10 AM	26875	26875
5/8/15 10:55 PM	23542		6/24/15 9:40 PM	22525		12/14/15 9:15 AM	27033	27033
5/8/15 11:00 PM	22120		7/4/15 11:55 PM	22421		12/14/15 9:20 AM	27292	27292
6/8/15 4:40 PM	22208		7/7/15 12:00 AM	24050		12/14/15 9:25 AM	27500	27500
6/8/15 4:45 PM	23583		7/7/15 12:05 AM	23708		12/14/15 9:30 AM	27625	27625
6/8/15 4:50 PM	24492		7/7/15 12:10 AM	22883		12/14/15 9:35 AM	27808	27808
6/8/15 4:55 PM	25142		8/14/15 5:35 PM	23903		12/14/15 9:40 AM	28000	28000
6/8/15 5:00 PM	25600	25600	8/14/15 5:40 PM	27580	27580	12/14/15 9:45 AM	28325	28325
6/8/15 5:05 PM	25217		8/14/15 5:45 PM	30925	30925	12/14/15 9:50 AM	28233	28233
6/8/15 5:10 PM	24733		8/14/15 5:50 PM	33842	33842	12/14/15 9:55 AM	28408	28408
6/8/15 5:15 PM	23692		8/14/15 5:55 PM	35250	35250	12/14/15 10:00 AM	28467	28467
6/8/15 5:20 PM	22208		8/14/15 6:00 PM	35742	35742	12/14/15 10:05 AM	28700	28700
6/16/15 8:20 AM	22400		8/14/15 6:05 PM	35617	35617	12/14/15 10:10 AM	28850	28850
6/16/15 8:25 AM	22600		8/14/15 6:10 PM	34783	34783	12/14/15 10:15 AM	28808	28808
6/16/15 8:30 AM	22700		8/14/15 6:15 PM	32239	32239	12/14/15 10:20 AM	29025	29025
6/16/15 8:35 AM	22733		8/14/15 6:20 PM	29086	29086	12/14/15 10:25 AM	29183	29183
6/16/15 8:40 AM	22733		8/14/15 6:25 PM	25466		12/14/15 10:30 AM	29333	29333
6/16/15 8:45 AM	22600		11/18/15 1:15 PM	22217		12/14/15 10:35 AM	29475	29475
6/16/15 8:50 AM	22517		11/18/15 1:20 PM	22567		12/14/15 10:40 AM	29500	29500
6/16/15 8:55 AM	22358		11/18/15 1:25 PM	22583		12/14/15 10:45 AM	29433	29433
6/16/15 9:00 AM	22117		11/18/15 1:30 PM	22392		12/14/15 10:50 AM	29742	29742
6/22/15 6:50 PM	22751		12/14/15 7:30 AM	22375		12/14/15 10:55 AM	29975	29975
6/22/15 6:55 PM	24614		12/14/15 7:35 AM	23283		12/14/15 11:00 AM	30183	30183
6/22/15 7:00 PM	25950	25950	12/14/15 7:40 AM	24175		12/14/15 11:05 AM	30417	30417
6/22/15 7:05 PM	26508	26508	12/14/15 7:45 AM	24708		12/14/15 11:10 AM	30767	30767
6/22/15 7:10 PM	26717	26717	12/14/15 7:50 AM	25275		12/14/15 11:15 AM	31283	31283
6/22/15 7:15 PM	26358	26358	12/14/15 7:55 AM	25683	25683	12/14/15 11:20 AM	31508	31508
6/22/15 7:20 PM	25883	25883	12/14/15 8:00 AM	25858	25858	12/14/15 11:25 AM	31742	31742
6/22/15 7:25 PM	24492		12/14/15 8:05 AM	26125	26125	12/14/15 11:30 AM	31983	31983
6/22/15 7:30 PM	22883		12/14/15 8:10 AM	26408	26408	12/14/15 11:35 AM	32167	32167

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
12/14/15 11:45 AM	32642	32642	12/14/15 3:20 PM	26608	26608	12/14/15 6:55 PM	26650	26650
12/14/15 11:50 AM	32850	32850	12/14/15 3:25 PM	26242	26242	12/14/15 7:00 PM	26592	26592
12/14/15 11:55 AM	32775	32775	12/14/15 3:30 PM	25983	25983	12/14/15 7:05 PM	26417	26417
12/14/15 12:00 PM	32900	32900	12/14/15 3:35 PM	25758	25758	12/14/15 7:10 PM	26267	26267
12/14/15 12:05 PM	32733	32733	12/14/15 3:40 PM	25683	25683	12/14/15 7:15 PM	26392	26392
12/14/15 12:10 PM	32642	32642	12/14/15 3:45 PM	25475		12/14/15 7:20 PM	26300	26300
12/14/15 12:15 PM	32417	32417	12/14/15 3:50 PM	25217		12/14/15 7:25 PM	26392	26392
12/14/15 12:20 PM	32275	32275	12/14/15 3:55 PM	24925		12/14/15 7:30 PM	26325	26325
12/14/15 12:25 PM	32000	32000	12/14/15 4:00 PM	24858		12/14/15 7:35 PM	26233	26233
12/14/15 12:30 PM	31717	31717	12/14/15 4:05 PM	24617		12/14/15 7:40 PM	26258	26258
12/14/15 12:35 PM	31433	31433	12/14/15 4:10 PM	24508		12/14/15 7:45 PM	26308	26308
12/14/15 12:40 PM	31100	31100	12/14/15 4:15 PM	24333		12/14/15 7:50 PM	26167	26167
12/14/15 12:45 PM	30800	30800	12/14/15 4:20 PM	24242		12/14/15 7:55 PM	26117	26117
12/14/15 12:50 PM	30383	30383	12/14/15 4:25 PM	24233		12/14/15 8:00 PM	26000	26000
12/14/15 12:55 PM	30092	30092	12/14/15 4:30 PM	24067		12/14/15 8:05 PM	25975	25975
12/14/15 1:00 PM	29625	29625	12/14/15 4:35 PM	23992		12/14/15 8:10 PM	25858	25858
12/14/15 1:05 PM	29375	29375	12/14/15 4:40 PM	23883		12/14/15 8:15 PM	25550	25550
12/14/15 1:10 PM	29050	29050	12/14/15 4:45 PM	23958		12/14/15 8:20 PM	25375	
12/14/15 1:15 PM	28808	28808	12/14/15 4:50 PM	24075		12/14/15 8:25 PM	25100	
12/14/15 1:20 PM	28500	28500	12/14/15 4:55 PM	24267		12/14/15 8:30 PM	24800	
12/14/15 1:25 PM	28433	28433	12/14/15 5:00 PM	24292		12/14/15 8:35 PM	24492	
12/14/15 1:30 PM	28392	28392	12/14/15 5:05 PM	24483		12/14/15 8:40 PM	24192	
12/14/15 1:35 PM	28417	28417	12/14/15 5:10 PM	24808		12/14/15 8:45 PM	23875	
12/14/15 1:40 PM	28500	28500	12/14/15 5:15 PM	25017		12/14/15 8:50 PM	23600	
12/14/15 1:45 PM	28333	28333	12/14/15 5:20 PM	25342		12/14/15 8:55 PM	23433	
12/14/15 1:50 PM	28367	28367	12/14/15 5:25 PM	25600	25600	12/14/15 9:00 PM	23150	
12/14/15 1:55 PM	28283	28283	12/14/15 5:30 PM	26017	26017	12/14/15 9:05 PM	22967	
12/14/15 2:00 PM	28458	28458	12/14/15 5:35 PM	26275	26275	12/14/15 9:10 PM	22908	
12/14/15 2:05 PM	28658	28658	12/14/15 5:40 PM	26625	26625	12/14/15 9:15 PM	22992	
12/14/15 2:10 PM	28833	28833	12/14/15 5:45 PM	26767	26767	12/14/15 9:20 PM	23142	
12/14/15 2:15 PM	28692	28692	12/14/15 5:50 PM	27025	27025	12/14/15 9:25 PM	23342	
12/14/15 2:20 PM	28667	28667	12/14/15 5:55 PM	27283	27283	12/14/15 9:30 PM	23483	
12/14/15 2:25 PM	28725	28725	12/14/15 6:00 PM	27475	27475	12/14/15 9:35 PM	23842	
12/14/15 2:30 PM	28567	28567	12/14/15 6:05 PM	27583	27583	12/14/15 9:40 PM	24200	
12/14/15 2:35 PM	28408	28408	12/14/15 6:10 PM	27525	27525	12/14/15 9:45 PM	24308	
12/14/15 2:40 PM	28175	28175	12/14/15 6:15 PM	27517	27517	12/14/15 9:50 PM	24642	
12/14/15 2:45 PM	28150	28150	12/14/15 6:20 PM	27383	27383	12/14/15 9:55 PM	24792	
12/14/15 2:50 PM	28050	28050	12/14/15 6:25 PM	27150	27150	12/14/15 10:00 PM	25142	
12/14/15 2:55 PM	27908	27908	12/14/15 6:30 PM	27183	27183	12/14/15 10:05 PM	25283	
12/14/15 3:00 PM	27642	27642	12/14/15 6:35 PM	27208	27208	12/14/15 10:10 PM	25658	25658
12/14/15 3:05 PM	27367	27367	12/14/15 6:40 PM	26975	26975	12/14/15 10:15 PM	25608	25608
12/14/15 3:10 PM	26967	26967	12/14/15 6:45 PM	26942	26942	12/14/15 10:20 PM	25533	25533
12/14/15 3:15 PM	26800	26800	12/14/15 6:50 PM	26800	26800	12/14/15 10:25 PM	25542	25542

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
12/14/15 10:30 PM	25367		12/15/15 3:40 AM	24400		12/23/15 10:00 PM	23058	
12/14/15 10:35 PM	25042		12/15/15 3:45 AM	24367		12/23/15 10:05 PM	23200	
12/14/15 10:40 PM	24617		12/15/15 3:50 AM	24442		12/23/15 10:10 PM	23408	
12/14/15 10:45 PM	24142		12/15/15 3:55 AM	24375		12/23/15 10:15 PM	23517	
12/14/15 10:50 PM	23600		12/15/15 4:00 AM	24417		12/23/15 10:20 PM	23617	
12/14/15 10:55 PM	23375		12/15/15 4:05 AM	24208		12/23/15 10:25 PM	23733	
12/14/15 11:00 PM	22808		12/15/15 4:10 AM	23983		12/23/15 10:30 PM	23975	
12/14/15 11:05 PM	22225		12/15/15 4:15 AM	23800		12/23/15 10:35 PM	24075	
12/15/15 12:35 AM	22425		12/15/15 4:20 AM	23217		12/23/15 10:40 PM	24183	
12/15/15 12:40 AM	23325		12/15/15 4:25 AM	23083		12/23/15 10:45 PM	24383	
12/15/15 12:45 AM	24392		12/15/15 4:30 AM	22817		12/23/15 10:50 PM	24675	
12/15/15 12:50 AM	25408		12/15/15 4:35 AM	22525		12/23/15 10:55 PM	24742	
12/15/15 12:55 AM	26267	26267	12/15/15 4:40 AM	22275		12/23/15 11:00 PM	24783	
12/15/15 1:00 AM	27192	27192	12/16/15 3:15 PM	22842		12/23/15 11:05 PM	24858	
12/15/15 1:05 AM	27925	27925	12/16/15 3:20 PM	24083		12/23/15 11:10 PM	24950	
12/15/15 1:10 AM	28558	28558	12/16/15 3:25 PM	25225		12/23/15 11:15 PM	25075	
12/15/15 1:15 AM	28875	28875	12/16/15 3:30 PM	26075	26075	12/23/15 11:20 PM	25208	
12/15/15 1:20 AM	28925	28925	12/16/15 3:35 PM	26483	26483	12/23/15 11:25 PM	25317	
12/15/15 1:25 AM	29075	29075	12/16/15 3:40 PM	26842	26842	12/23/15 11:30 PM	25333	
12/15/15 1:30 AM	28875	28875	12/16/15 3:45 PM	27083	27083	12/23/15 11:35 PM	25433	
12/15/15 1:35 AM	28475	28475	12/16/15 3:50 PM	26858	26858	12/23/15 11:40 PM	25592	25592
12/15/15 1:40 AM	28042	28042	12/16/15 3:55 PM	26650	26650	12/23/15 11:45 PM	25742	25742
12/15/15 1:45 AM	27592	27592	12/16/15 4:00 PM	26208	26208	12/23/15 11:50 PM	25667	25667
12/15/15 1:50 AM	26858	26858	12/16/15 4:05 PM	25742	25742	12/23/15 11:55 PM	25783	25783
12/15/15 1:55 AM	26292	26292	12/16/15 4:10 PM	25042		12/24/15 12:00 AM	25892	25892
12/15/15 2:00 AM	25692	25692	12/16/15 4:15 PM	24450		12/24/15 12:05 AM	25792	25792
12/15/15 2:05 AM	24975		12/16/15 4:20 PM	23600		12/24/15 12:10 AM	25650	25650
12/15/15 2:10 AM	24175		12/16/15 4:25 PM	22817		12/24/15 12:15 AM	25425	
12/15/15 2:15 AM	23708		12/17/15 4:00 AM	22275		12/24/15 12:20 AM	25233	
12/15/15 2:20 AM	23433		12/17/15 4:05 AM	23150		12/24/15 12:25 AM	24833	
12/15/15 2:25 AM	22967		12/17/15 4:10 AM	23758		12/24/15 12:30 AM	24425	
12/15/15 2:30 AM	22558		12/17/15 4:15 AM	24200		12/24/15 12:35 AM	24175	
12/15/15 2:35 AM	22383		12/17/15 4:20 AM	24550		12/24/15 12:40 AM	23667	
12/15/15 2:40 AM	22350		12/17/15 4:25 AM	24825		12/24/15 12:45 AM	23017	
12/15/15 2:45 AM	22267		12/17/15 4:30 AM	25042		12/24/15 12:50 AM	22383	
12/15/15 2:50 AM	22358		12/17/15 4:35 AM	25050		12/24/15 10:55 AM	22450	
12/15/15 2:55 AM	22450		12/17/15 4:40 AM	25108		12/24/15 11:00 AM	24133	
12/15/15 3:00 AM	22592		12/17/15 4:45 AM	24983		12/24/15 11:05 AM	25617	25617
12/15/15 3:05 AM	22975		12/17/15 4:50 AM	24475		12/24/15 11:10 AM	26608	26608
12/15/15 3:10 AM	23425		12/17/15 4:55 AM	24067		12/24/15 11:15 AM	27633	27633
12/15/15 3:15 AM	23617		12/17/15 5:00 AM	23392		12/24/15 11:20 AM	28308	28308
12/15/15 3:20 AM	23900		12/17/15 5:05 AM	22700		12/24/15 11:25 AM	28908	28908
12/15/15 3:25 AM	23967		12/23/15 9:45 PM	22517		12/24/15 11:30 AM	29158	29158
12/15/15 3:30 AM	24133		12/23/15 9:50 PM	22675		12/24/15 11:35 AM	28942	28942
12/15/15 3:35 AM	24408		12/23/15 9:55 PM	22817		12/24/15 11:40 AM	28667	28667

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
12/24/15 11:45 AM	28117	28117	12/27/15 10:50 AM	22258		3/16/16 11:15 AM	22233	
12/24/15 11:50 AM	27408	27408	1/4/16 4:40 AM	23059		3/16/16 1:00 PM	22633	
12/24/15 11:55 AM	26733	26733	1/4/16 4:45 AM	25167		3/16/16 1:05 PM	23167	
12/24/15 12:00 PM	25633	25633	1/4/16 4:50 AM	26350	26350	3/16/16 1:10 PM	23625	
12/24/15 12:05 PM	24733		1/4/16 4:55 AM	27175	27175	3/16/16 1:15 PM	23958	
12/24/15 12:10 PM	23733		1/4/16 5:00 AM	27600	27600	3/16/16 1:20 PM	24108	
12/24/15 12:15 PM	22717		1/4/16 5:05 AM	27675	27675	3/16/16 1:25 PM	24250	
12/24/15 4:10 PM	23050		1/4/16 5:10 AM	27317	27317	3/16/16 1:30 PM	24183	
12/24/15 4:15 PM	23517		1/4/16 5:15 AM	26942	26942	3/16/16 1:35 PM	23933	
12/24/15 4:20 PM	24008		1/4/16 5:20 AM	26250	26250	3/16/16 1:40 PM	23442	
12/24/15 4:25 PM	24450		1/4/16 5:25 AM	25392		3/16/16 1:45 PM	22958	
12/24/15 4:30 PM	24467		1/4/16 5:30 AM	24417		3/16/16 1:50 PM	22242	
12/24/15 4:35 PM	24383		1/4/16 5:35 AM	23483		3/16/16 4:00 PM	22192	
12/24/15 4:40 PM	23900		1/4/16 5:40 AM	22625		3/16/16 4:05 PM	22467	
12/24/15 4:45 PM	23525		2/29/16 1:20 PM	22150		3/16/16 4:10 PM	22533	
12/24/15 4:50 PM	22792		2/29/16 1:25 PM	22383		3/16/16 4:15 PM	22392	
12/24/15 4:55 PM	22142		2/29/16 1:30 PM	22533		3/16/16 4:20 PM	22242	
12/25/15 2:20 AM	22950		2/29/16 1:35 PM	22425		3/17/16 7:50 AM	22358	
12/25/15 2:25 AM	23633		2/29/16 1:40 PM	22192		3/17/16 7:55 AM	22475	
12/25/15 2:30 AM	24192		3/1/16 10:05 AM	22283		3/17/16 8:00 AM	22442	
12/25/15 2:35 AM	24325		3/1/16 10:10 AM	22483		3/17/16 8:05 AM	22367	
12/25/15 2:40 AM	24567		3/1/16 10:15 AM	22675		3/17/16 8:10 AM	22183	
12/25/15 2:45 AM	24717		3/1/16 10:20 AM	22575		3/17/16 8:15 AM	22150	
12/25/15 2:50 AM	24825		3/1/16 10:25 AM	22417		3/20/16 11:00 PM	22727	
12/25/15 2:55 AM	24575		3/1/16 10:30 AM	22258		3/20/16 11:05 PM	24575	
12/25/15 3:00 AM	24125		3/1/16 10:35 AM	22142		3/20/16 11:10 PM	26267	26267
12/25/15 3:05 AM	23808		3/16/16 9:40 AM	22475		3/20/16 11:15 PM	27583	27583
12/25/15 3:10 AM	23500		3/16/16 9:45 AM	24008		3/20/16 11:20 PM	28333	28333
12/25/15 3:15 AM	22983		3/16/16 9:50 AM	25567	25567	3/20/16 11:25 PM	29058	29058
12/25/15 3:20 AM	22458		3/16/16 9:55 AM	26883	26883	3/20/16 11:30 PM	29558	29558
12/25/15 3:25 AM	22150		3/16/16 10:00 AM	27817	27817	3/20/16 11:35 PM	29700	29700
12/25/15 12:45 PM	22367		3/16/16 10:05 AM	28608	28608	3/20/16 11:40 PM	29233	29233
12/25/15 12:50 PM	22692		3/16/16 10:10 AM	29175	29175	3/20/16 11:45 PM	28767	28767
12/25/15 12:55 PM	23050		3/16/16 10:15 AM	29650	29650	3/20/16 11:50 PM	28075	28075
12/25/15 1:00 PM	23208		3/16/16 10:20 AM	29508	29508	3/20/16 11:55 PM	27242	27242
12/25/15 1:05 PM	23333		3/16/16 10:25 AM	29442	29442	3/21/16 12:00 AM	26042	26042
12/25/15 1:10 PM	23242		3/16/16 10:30 AM	29350	29350	3/21/16 12:05 AM	24975	
12/25/15 1:15 PM	23050		3/16/16 10:35 AM	28742	28742	3/21/16 12:10 AM	23725	
12/25/15 1:20 PM	22800		3/16/16 10:40 AM	28025	28025	3/21/16 12:15 AM	22650	
12/25/15 1:25 PM	22542		3/16/16 10:45 AM	27417	27417	3/24/16 4:10 PM	22850	
12/25/15 1:30 PM	22192		3/16/16 10:50 AM	26650	26650	3/24/16 4:15 PM	23633	
12/27/15 10:30 AM	22208		3/16/16 10:55 AM	25908	25908	3/24/16 4:20 PM	24275	
12/27/15 10:35 AM	22250		3/16/16 11:00 AM	25058		3/24/16 4:25 PM	24650	
12/27/15 10:40 AM	22417		3/16/16 11:05 AM	24125		3/24/16 4:30 PM	25208	
12/27/15 10:45 AM	22450		3/16/16 11:10 AM	23233		3/24/16 4:35 PM	25508	25508

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
3/24/16 4:40 PM	25650	25650	3/28/16 4:05 PM	24542		3/31/16 8:35 PM	23317	
3/24/16 4:45 PM	25817	25817	3/28/16 4:10 PM	23700		3/31/16 8:40 PM	23100	
3/24/16 4:50 PM	25875	25875	3/28/16 4:15 PM	23025		3/31/16 8:45 PM	22583	
3/24/16 4:55 PM	25900	25900	3/28/16 4:20 PM	22108		3/31/16 8:50 PM	22250	
3/24/16 5:00 PM	25642	25642	3/31/16 1:40 PM	22325		3/31/16 10:10 PM	22600	
3/24/16 5:05 PM	25458		3/31/16 1:45 PM	23025		3/31/16 10:15 PM	23067	
3/24/16 5:10 PM	25275		3/31/16 1:50 PM	23300		3/31/16 10:20 PM	23508	
3/24/16 5:15 PM	24825		3/31/16 1:55 PM	23708		3/31/16 10:25 PM	23625	
3/24/16 5:20 PM	24383		3/31/16 2:00 PM	23892		3/31/16 10:30 PM	23433	
3/24/16 5:25 PM	24025		3/31/16 2:05 PM	24075		3/31/16 10:35 PM	23300	
3/24/16 5:30 PM	23350		3/31/16 2:10 PM	24067		3/31/16 10:40 PM	22908	
3/24/16 5:35 PM	22917		3/31/16 2:15 PM	24008		3/31/16 10:45 PM	22250	
3/24/16 5:40 PM	22358		3/31/16 2:20 PM	23808		4/1/16 12:35 AM	22175	
3/24/16 9:45 PM	22475		3/31/16 2:25 PM	23508		4/1/16 12:40 AM	23517	
3/24/16 9:50 PM	22917		3/31/16 2:30 PM	23400		4/1/16 12:45 AM	24567	
3/24/16 9:55 PM	23183		3/31/16 2:35 PM	23092		4/1/16 12:50 AM	25458	
3/24/16 10:00 PM	23058		3/31/16 2:40 PM	22858		4/1/16 12:55 AM	26033	26033
3/24/16 10:05 PM	22725		3/31/16 2:45 PM	22583		4/1/16 1:00 AM	26517	26517
3/24/16 10:10 PM	22325		3/31/16 2:50 PM	22442		4/1/16 1:05 AM	26825	26825
3/28/16 12:50 AM	22492		3/31/16 2:55 PM	22308		4/1/16 1:10 AM	27150	27150
3/28/16 12:55 AM	22767		3/31/16 3:00 PM	22292		4/1/16 1:15 AM	26967	26967
3/28/16 1:00 AM	22950		3/31/16 3:05 PM	22333		4/1/16 1:20 AM	26733	26733
3/28/16 1:05 AM	23275		3/31/16 3:10 PM	22200		4/1/16 1:25 AM	26375	26375
3/28/16 1:10 AM	23383		3/31/16 3:15 PM	22400		4/1/16 1:30 AM	26117	26117
3/28/16 1:15 AM	23542		3/31/16 3:20 PM	22458		4/1/16 1:35 AM	25808	25808
3/28/16 1:20 AM	23567		3/31/16 3:25 PM	22667		4/1/16 1:40 AM	25333	
3/28/16 1:25 AM	23600		3/31/16 3:30 PM	22825		4/1/16 1:45 AM	24933	
3/28/16 1:30 AM	23250		3/31/16 3:35 PM	23042		4/1/16 1:50 AM	24208	
3/28/16 1:35 AM	23150		3/31/16 3:40 PM	23325		4/1/16 1:55 AM	23883	
3/28/16 1:40 AM	22817		3/31/16 3:45 PM	23358		4/1/16 2:00 AM	23483	
3/28/16 1:45 AM	22358		3/31/16 3:50 PM	23317		4/1/16 2:05 AM	23008	
3/28/16 2:55 PM	22725		3/31/16 3:55 PM	23242		4/1/16 2:10 AM	22550	
3/28/16 3:00 PM	23625		3/31/16 4:00 PM	23167		4/1/16 2:15 AM	22308	
3/28/16 3:05 PM	24450		3/31/16 4:05 PM	22767		4/1/16 10:55 AM	22267	
3/28/16 3:10 PM	25158		3/31/16 4:10 PM	22675		4/1/16 11:00 AM	22317	
3/28/16 3:15 PM	25642	25642	3/31/16 4:15 PM	22350		4/1/16 11:05 AM	22383	
3/28/16 3:20 PM	26067	26067	3/31/16 7:50 PM	22125		4/1/16 11:10 AM	22417	
3/28/16 3:25 PM	26408	26408	3/31/16 7:55 PM	22358		4/1/16 11:15 AM	22342	
3/28/16 3:30 PM	26642	26642	3/31/16 8:00 PM	22650		4/1/16 11:20 AM	22208	
3/28/16 3:35 PM	26700	26700	3/31/16 8:05 PM	22875		4/1/16 11:25 AM	22275	
3/28/16 3:40 PM	26575	26575	3/31/16 8:10 PM	23083		4/1/16 11:30 AM	22117	
3/28/16 3:45 PM	26292	26292	3/31/16 8:15 PM	23300		4/1/16 6:10 PM	23100	
3/28/16 3:50 PM	26108	26108	3/31/16 8:20 PM	23567		4/1/16 6:15 PM	23942	
3/28/16 3:55 PM	25667	25667	3/31/16 8:25 PM	23650		4/1/16 6:20 PM	24675	
3/28/16 4:00 PM	25125		3/31/16 8:30 PM	23583		4/1/16 6:25 PM	25158	

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

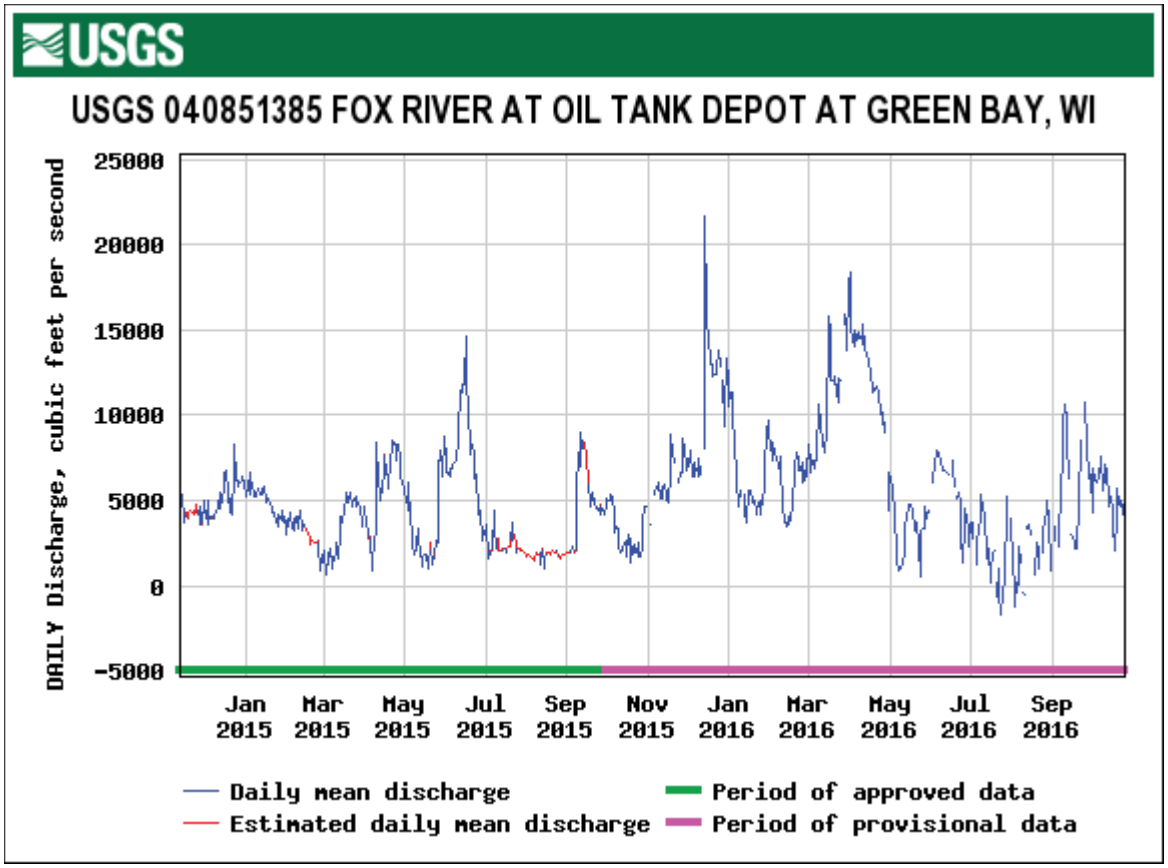
	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
4/1/16 6:30 PM	25733	25733	4/2/16 4:40 PM	24858		4/3/16 4:00 AM	24008	
4/1/16 6:35 PM	26058	26058	4/2/16 4:45 PM	24333		4/3/16 4:05 AM	23658	
4/1/16 6:40 PM	26117	26117	4/2/16 4:50 PM	23667		4/3/16 4:10 AM	23158	
4/1/16 6:45 PM	25950	25950	4/2/16 4:55 PM	23125		4/3/16 4:15 AM	22792	
4/1/16 6:50 PM	25958	25958	4/2/16 5:00 PM	22750		4/3/16 4:20 AM	22117	
4/1/16 6:55 PM	25725	25725	4/2/16 5:05 PM	22442		4/3/16 7:20 PM	24073	
4/1/16 7:00 PM	25483		4/2/16 5:10 PM	22417		4/3/16 7:25 PM	25967	25967
4/1/16 7:05 PM	25200		4/2/16 5:15 PM	22367		4/3/16 7:30 PM	27692	27692
4/1/16 7:10 PM	24758		4/2/16 5:20 PM	22708		4/3/16 7:35 PM	29058	29058
4/1/16 7:15 PM	24450		4/2/16 5:25 PM	22875		4/3/16 7:40 PM	29933	29933
4/1/16 7:20 PM	24042		4/2/16 5:30 PM	22858		4/3/16 7:45 PM	30475	30475
4/1/16 7:25 PM	23742		4/2/16 5:35 PM	23017		4/3/16 7:50 PM	30700	30700
4/1/16 7:30 PM	23200		4/2/16 5:40 PM	23275		4/3/16 7:55 PM	30658	30658
4/1/16 7:35 PM	22850		4/2/16 5:45 PM	23408		4/3/16 8:00 PM	30400	30400
4/1/16 7:40 PM	22783		4/2/16 5:50 PM	23675		4/3/16 8:05 PM	29783	29783
4/1/16 7:45 PM	22617		4/2/16 5:55 PM	23783		4/3/16 8:10 PM	29000	29000
4/1/16 7:50 PM	22367		4/2/16 6:00 PM	23900		4/3/16 8:15 PM	28100	28100
4/1/16 7:55 PM	22358		4/2/16 6:05 PM	23875		4/3/16 8:20 PM	27267	27267
4/2/16 5:45 AM	22533		4/2/16 6:10 PM	23808		4/3/16 8:25 PM	26367	26367
4/2/16 5:50 AM	23042		4/2/16 6:15 PM	23800		4/3/16 8:30 PM	25117	
4/2/16 5:55 AM	23717		4/2/16 6:20 PM	23608		4/3/16 8:35 PM	23958	
4/2/16 6:00 AM	24067		4/2/16 6:25 PM	23342		4/3/16 8:40 PM	23050	
4/2/16 6:05 AM	24408		4/2/16 6:30 PM	23108		4/4/16 9:50 PM	22167	
4/2/16 6:10 AM	24667		4/2/16 6:35 PM	22925		4/4/16 9:55 PM	22267	
4/2/16 6:15 AM	24775		4/2/16 6:40 PM	22675		4/4/16 10:00 PM	22325	
4/2/16 6:20 AM	24775		4/2/16 6:45 PM	22425		4/4/16 10:05 PM	22233	
4/2/16 6:25 AM	24542		4/2/16 6:50 PM	22125		4/4/16 10:10 PM	22117	
4/2/16 6:30 AM	24275		4/3/16 2:30 AM	22200		4/6/16 9:50 PM	22108	
4/2/16 6:35 AM	23725		4/3/16 2:35 AM	22650		4/6/16 9:55 PM	22592	
4/2/16 6:40 AM	23525		4/3/16 2:40 AM	23008		4/6/16 10:00 PM	22858	
4/2/16 6:45 AM	22808		4/3/16 2:45 AM	23400		4/6/16 10:05 PM	23075	
4/2/16 6:50 AM	22192		4/3/16 2:50 AM	23892		4/6/16 10:10 PM	23300	
4/2/16 3:35 PM	22731		4/3/16 2:55 AM	24383		4/6/16 10:15 PM	23492	
4/2/16 3:40 PM	24775		4/3/16 3:00 AM	24592		4/6/16 10:20 PM	23575	
4/2/16 3:45 PM	26150	26150	4/3/16 3:05 AM	24983		4/6/16 10:25 PM	23525	
4/2/16 3:50 PM	27492	27492	4/3/16 3:10 AM	25108		4/6/16 10:30 PM	23433	
4/2/16 3:55 PM	28225	28225	4/3/16 3:15 AM	25108		4/6/16 10:35 PM	23408	
4/2/16 4:00 PM	28642	28642	4/3/16 3:20 AM	25308		4/6/16 10:40 PM	23183	
4/2/16 4:05 PM	28633	28633	4/3/16 3:25 AM	25333		4/6/16 10:45 PM	23067	
4/2/16 4:10 PM	28308	28308	4/3/16 3:30 AM	25450		4/6/16 10:50 PM	22792	
4/2/16 4:15 PM	28058	28058	4/3/16 3:35 AM	25325		4/6/16 10:55 PM	22392	
4/2/16 4:20 PM	27317	27317	4/3/16 3:40 AM	25208		4/6/16 11:00 PM	22183	
4/2/16 4:25 PM	26650	26650	4/3/16 3:45 AM	25017		4/7/16 6:55 AM	22158	
4/2/16 4:30 PM	26117	26117	4/3/16 3:50 AM	24750		4/7/16 7:00 AM	22158	
4/2/16 4:35 PM	25442		4/3/16 3:55 AM	24433		4/8/16 6:45 PM	22200	

Hourly Average Flows Exceeding 20-Year (22,100 cfs) and 100-Year (25,500 cfs) Recurrence Intervals

	Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals			Flows Exceeding Recurrence Intervals	
Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)	Date and Time	20-Year (cfs)	100-Year (cfs)
4/8/16 6:50 PM	23267		4/9/16 7:25 PM	22575		9/10/16 11:00 PM	22508	
4/8/16 6:55 PM	24000		4/9/16 7:30 PM	22325		9/22/16 7:05 AM	22625	
4/8/16 7:00 PM	24333		4/9/16 7:35 PM	22175		9/22/16 7:10 AM	23242	
4/8/16 7:05 PM	24200		4/13/16 9:55 AM	22325		9/22/16 7:15 AM	23250	
4/8/16 7:10 PM	23850		4/13/16 10:00 AM	22450		9/22/16 7:20 AM	22700	
4/8/16 7:15 PM	23242		4/13/16 10:05 AM	22608		9/22/16 1:00 PM	22133	
4/8/16 7:20 PM	22750		4/13/16 10:10 AM	22633		9/22/16 10:00 PM	23408	
4/8/16 10:00 PM	22308		4/13/16 10:15 AM	22675		9/22/16 10:05 PM	25550	25550
4/8/16 10:05 PM	23150		4/13/16 10:20 AM	22550		9/22/16 10:10 PM	26925	26925
4/8/16 10:10 PM	24083		4/13/16 10:25 AM	22192		9/22/16 10:15 PM	28033	28033
4/8/16 10:15 PM	24775		6/10/16 8:30 PM	22915		9/22/16 10:20 PM	28567	28567
4/8/16 10:20 PM	25458		6/10/16 8:35 PM	25886	25886	9/22/16 10:25 PM	28667	28667
4/8/16 10:25 PM	26067	26067	6/10/16 8:40 PM	28302	28302	9/22/16 10:30 PM	28550	28550
4/8/16 10:30 PM	26642	26642	6/10/16 8:45 PM	29925	29925	9/22/16 10:35 PM	27975	27975
4/8/16 10:35 PM	26950	26950	6/10/16 8:50 PM	30558	30558	9/22/16 10:40 PM	26975	26975
4/8/16 10:40 PM	27250	27250	6/10/16 8:55 PM	30750	30750	9/22/16 10:45 PM	25633	25633
4/8/16 10:45 PM	27442	27442	6/10/16 9:00 PM	29942	29942	9/22/16 10:50 PM	24225	
4/8/16 10:50 PM	27400	27400	6/10/16 9:05 PM	29217	29217	9/22/16 10:55 PM	22483	
4/8/16 10:55 PM	27250	27250	6/10/16 9:10 PM	27617	27617			
4/8/16 11:00 PM	27025	27025	6/10/16 9:15 PM	25800	25800			
4/8/16 11:05 PM	26708	26708	6/10/16 9:20 PM	23488				
4/8/16 11:10 PM	26075	26075	6/26/16 4:30 AM	22367				
4/8/16 11:15 PM	25692	25692	6/26/16 4:35 AM	23150				
4/8/16 11:20 PM	25042		6/26/16 4:40 AM	23258				
4/8/16 11:25 PM	24400		6/26/16 4:45 AM	23167				
4/8/16 11:30 PM	23917		6/26/16 4:50 AM	22808				
4/8/16 11:35 PM	23275		6/26/16 4:55 AM	22108				
4/8/16 11:40 PM	22625		7/6/16 10:25 PM	23922				
4/9/16 9:40 AM	22267		7/6/16 10:30 PM	24933				
4/9/16 9:45 AM	22442		7/6/16 10:35 PM	25442				
4/9/16 9:50 AM	22558		7/6/16 10:40 PM	25333				
4/9/16 9:55 AM	22617		7/6/16 10:45 PM	24700				
4/9/16 10:00 AM	22667		7/6/16 10:50 PM	23700				
4/9/16 10:05 AM	22700		7/6/16 10:55 PM	22242				
4/9/16 10:10 AM	22567		7/8/16 11:50 PM	22542				
4/9/16 10:15 AM	22417		7/8/16 11:55 PM	22892				
4/9/16 10:20 AM	22125		7/9/16 12:00 AM	23067				
4/9/16 6:45 PM	22350		7/9/16 12:05 AM	23033				
4/9/16 6:50 PM	22800		7/9/16 12:10 AM	22792				
4/9/16 6:55 PM	22925		7/9/16 12:15 AM	22333				
4/9/16 7:00 PM	22883		9/10/16 10:35 PM	22333				
4/9/16 7:05 PM	22900		9/10/16 10:40 PM	22633				
4/9/16 7:10 PM	22792		9/10/16 10:45 PM	22900				
4/9/16 7:15 PM	22692		9/10/16 10:50 PM	22925				
4/9/16 7:20 PM	22625		9/10/16 10:55 PM	22742				

Data from http://waterdata.usgs.gov/nwis/ for the U.S. Oil Tank Depot (USGS gauging station 040851385).

cfs = cubic feet per second


USGS
USGS 040851385 FOX RIVER AT OIL TANK DEPOT AT GREEN BAY, WI
DAILY Discharge, cubic feet per second
25000
20000
15000
10000
5000
0
-5000
Jan 2015
Mar 2015
May 2015
Jul 2015
Sep 2015
Nov 2015
Jan 2016
Mar 2016
May 2016
Jul 2016
Sep 2016
Daily mean discharge
Estimated daily mean discharge
Period of approved data
Period of provisional data